CYCLING

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FOR

HEALTH AND PLEASURE

An Indispensable Guide to the Successful Use of the Wheel

BY

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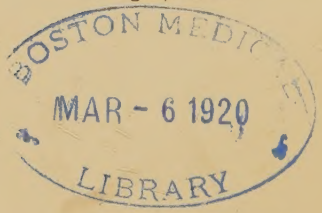

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PREFACE.

THE present work on the Health, Pleasures, Advantages, and Practice of Cycling is based largely on the author's previous writings on the same subjects, and principally on a volume bearing the same name which he published in 1890. But the changes that have taken place since the other work was written have been so great that no mere revision, but a complete rewriting proved necessary, in order to eliminate portions that were out of date, and to add very much that was new and important. As to the title, nothing could be found that so fully and concisely expressed the nature of this work as "Cycling for Health and Pleasure," and the fact that the author had previously used it for a work now long out of print constitutes no good ground for not again employing it.

The author's connection with cycling began about 1870, with the wooden two-wheeled velocipede which had shortly before that created such a furore, and he rode and owned one of those ancient vehicles. In 1876 the first modern high bicycles were shown at the Centennial Exposition, and a few came into use in this country during the next three or four years. In 1880 the author pur-

chased one, and rode it and others until the introduction of the safety, trying each new type as it appeared. He has ridden constantly, not only for pleasure, but because it has proved to him the only means of maintaining health. Every other form of exercise, including horseback riding, had been tried without success; but, after six weeks of regular riding, cycling began to prove its efficacy, and soon established a degree of health which before that was wholly unknown. Other members of his family have had similar experiences, as well as very many friends and acquaintances. Under such circumstances, it is impossible, for him at least, not to believe cycling to be the most beneficial, as it is the most exhilarating, of all exercises.

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CHAPTER I.

CYCLING FOR HEALTH.

We claim a great utility that daily must increase;
We claim from inactivity a sensible release;
A constant mental, physical, and moral help we feel,
That bids us turn enthusiasts, and cry "God bless the wheel!"

—*Will Carleton.*

IT is a fact well known to everyone that proper food and sufficient sleep are essential to the maintenance of health; but it is by no means so generally understood that these alone will not insure it unless fortified by the practice of suitable exercise. Improper food so quickly affects our stomachs, and insufficient sleep makes us so drowsy, that the connection between cause and effect is very clear in these cases; but the ills that result from the lack of sufficient suitable exercise are less readily traced to their true source. They come so slowly, and get their grasp upon us

so insidiously, that when we really begin to suffer from them we rarely dream of their real causes.

Food, sleep, and exercise are so indissolubly connected in their relations to the *mens sana in corpore sano* that to separate any one of the trio from the others is to seriously impair the efficacy of all, and render it impossible for the remaining ones to perform perfect service. These facts do not apply with full force to those persons—few in number—who inherit iron constitutions, and who can, with *apparent* impunity, set the laws of nature more or less at defiance, though sooner or later they must inevitably feel some effect from doing so; but they do apply to an enormous majority of mankind, including many who boast of their health because they seem free from disease, and others whose apparent vigor rests upon the constant use of stimulants.

Exercise is not merely a desirable adjunct of food and sleep, to be used supplementary to them if agreeable and convenient; but it is, in a high degree, the very means through which it is possible for them to become effective. If one took absolutely no exercise at all, it would be hardly possible to digest food or to get refreshing sleep, and good health would scarcely be expected. With moderate exercise, these conditions would change somewhat. It thus follows naturally that, with sufficient exercise of proper character, the system would be so toned as to enable the stomach to do its work perfectly and secure refreshing and vivifying sleep; and experience and observation show this to be perfectly true.

It is often remarked that enough exercise can be obtained in the performance of one's daily duties, and this is sometimes true, provided a person possesses a very vigorous constitution and is engaged in a congenial, active occupation. For the majority, however, and particularly for those whose occupations are at all sedentary, it is wholly untrue. "Work is not exercise," says an experienced physician. "This may seem strange, but it is true. I tell my patient, 'I do not care how much you run about all day at your business, you *must* take the exercise I prescribe quite independently of your work.' There are perhaps no more hard-working men in the world than the Scotch plowmen—wearily plodding all day long behind their horses, in wet weather or dry; no sooner, however, has the sun 'gane west the loch,' and the day's work is done, than, after supper and a good wash, those hardy lads assemble in the glen, and not only for one, but often three good hours, keep up the health-giving games for which their nation is so justly celebrated."

If our daily occupations really afforded true exercise, we would not suffer, as we nearly all do, from troubles which disappear as soon as we engage in regular exercise of an *agreeable* and *suitable* kind. "Dyspepsia, no matter how produced," says Dr. Stables, "is the curse of the age in which we live. It kills, directly or indirectly, ten times more human beings than consumption itself does in our country. If this be so, it is surely of the utmost importance to each and all of us to so regulate our diet that we may be able to say

truly we eat to live. Slow digestion is only the forerunner of dyspepsia, and this is usually accompanied with constipation, or costiveness, and a dry state of the whole mucous membrane of the digestive canal. A sedentary life and the consequent want of sufficient exercise in the open air are two of the commonest causes of slow digestion. Cycling is, of all kinds of exercises that I know, far and away the best suited for the removal of slow digestion. Few, alas! value sufficiently the blessing of health until it begins to slip away. We are not all born with healthful constitutions, but even those who are born weakly can do much to strengthen and vivify their systems, by adopting a plan of judicious and rational living; by steering clear of that rock on which so many lives are lost —I mean the abuse of medicine; by proper attention to cleanliness; by drinking only pure water; by breathing, as far as possible, only pure air; by avoiding worry as much as they can; by being temperate, not only in eating and drinking, but in everything; and by taking a proper amount of exercise of the kind most suited for the individual health—the best by far at the present day being what we term cycling."

In his recent work, Dr. Lagrange says: "Exercise produces in the system two absolutely different effects; it increases the process of assimilation, thanks to which the body gains new tissues, and it accelerates the process of dissimilation, which leads to the destruction of certain materials. . . Exercise introduces more oxygen into the system than is actually needed for the combustions; at least,

direct observation seems to show that, in the period which follows vigorous exercise, the blood, after being for a short time surcharged with carbonic acid, becomes on the other hand surcharged with oxygen. Thus a man taking exercise lays up a provision of oxygen. The gas becomes as it were stored among the anatomical elements of which the organism is built up; it is especially bound to the red blood-disks, which become redder, and their vivifying power is increased. This more living blood, if we may use the expression, carries to the organs a salutary stimulus which increases the activity of their functions.

"It has been experimentally proved that all the elements of the system undergo a kind of awakening of their energies under the influence of strongly oxygenated blood. If such blood be injected we see glands secrete more actively, the contractility of fatigued muscles reappear, and even signs of life in the cerebral cells of a decapitated animal. We understand how, under the influence of powerfully oxygenated blood, the glands of the alimentary canal can more actively secrete the fluids necessary for the elaboration of the food; how the contractile fibers of the intestine perform their peristaltic movements, which are as necessary for digestion, with more energy; how the absorbent vessels draw to themselves, by a more powerful endosmotic process, the nutritive molecules elaborated in the digestive tract. Thus the acquisition of a greater quantity of oxygen leads to a greater intensity of the process of assimilation. Exercise produces these salutary effects alike in those who assimilate

too little, and in those who do not dissimilate enough ; muscular work is a regulator of nutrition as indispensable to over-rich as it is to impoverished constitutions. Hence there is no individual, no living being, who is not instinctively impelled to this powerful general alterative agent. . . Observation of facts shows that athletic exercises, when they are not beyond the strength of the subject, place him in the most favorable conditions of nutrition. Under the guidance of a quiet nervous system, the functions of repair are performed with the most perfect regularity, and we see that the acquisitions made by the system through more perfect assimilation exceed the losses brought about by work."

It appears from the foregoing that vigorous exercise in the open air introduces large quantities of oxygen into the system ; that the blood is vivified thereby ; that assimilation becomes more perfect, and nutrition more complete ; and that all organs are stimulated to perform their functions perfectly. The increased quantity of oxygen which thus vivifies the blood, as the result of exercise, is carried to it by means of the respiration, consequently "respiration is the most important of the functions influenced by exercise."

To quote Dr. Lagrange again : "If we compare exercises of strength and exercises of speed, we find in them the common character of rendering respiration more active. But the exercises of strength only bring about this result at the price of intense muscular fatigue, while exercises of speed allow the work to be carried on till breath-

lessness is produced without the muscles becoming painful from the work. Speed can supplement force, and enable certain persons, whose muscular development is feeble, to benefit from the general effects of violent exercise, without needing intense efforts, which they would be unable to perform.

"Exercises of speed have the advantage of producing the same quantity of work as the exercises of strength, and of producing the same intensity of respiratory need. Further, they increase the activity of the respiratory functions with less fatigue of the lungs and heart, owing to the absence of effort, which only exceptionally occurs in exercises of speed, but which is obligatory in exercises of strength. Hence a cause for preferring exercises of speed. As regards the muscular system, an exercise of speed, for an equal number of kilogrammeters in a given time, will produce less fatigue than a work of strength, and will subject the motor apparatus in a less degree to the various accidents resulting from shocks, and frictions of its constituent parts."

Of course, if a person desires the mere development of brute strength—the increase in size of certain muscles—he will undertake exercises of strength under competent instruction; because "powerful and sustained contractions favor the nutrition of the muscular fiber," the nutrition of a muscle being "more intense in slow contractions, because the flow of blood is more regular and more prolonged," and in this way the muscles increase in size and strength most rapidly. But if, on the other hand, the object of exercise is the promotion

of the sound health of the whole system, rather than special development of one part, exercises of speed insures the best results, besides being the most exhilarating and pleasurable.

If the complex conditions of modern life did not keep us so very far from a "state of nature," in which all could have more or less active occupation, it might be possible to get along tolerably well with such exercise as came incidentally in performing our daily duties; but our constitutions and habits have become so modified through heredity and environment that our need of the *most effective exercise* is far greater than it would be were the conditions of life more simple. Our lives are more artificial than natural; forced living, competition, and excitement have replaced simple, primitive conditions; plain food has given way to that which is hard to digest; and every constitution has a heavier load to bear, and more work to do to maintain health, than if living were more simple and natural. As a powerful aid to everyone's constitution in its "struggle for existence," the most effective kind of exercise that can be discovered is a prime necessity.

Exercise may be gentle, moderate, or violent. A person of sedentary habits, or feeble strength, must begin with that which is gentle, and proceed by easy stages to that which is moderate, and later, if he wishes, go on by degrees to that which is violent. Dr. Lagrange defines these grades as follows: "When, after an exercise, a man of average strength has experienced neither fatigue nor breathlessness the exercise may be called gentle. When

the exercise has caused local fatigue without inducing breathlessness, it will be moderate. It will be called violent when it is accompanied and followed by breathlessness."

In undertaking an unaccustomed, though gentle, form of exercise, it may seem to be moderate, or even violent, at the start, simply because most persons are in far poorer physical condition than they imagine themselves to be; but if they begin with short lessons, and proceed by easy stages, they will soon become stronger, and the exercise will become much easier. Any exercise, says Dr. Stables, "to be really beneficial, ought to be taken in moderation, and should extend over some considerable time. Spurts, and that amount of exercise that borders on fatigue, should mostly be avoided. Whenever the body becomes tired, exertion, instead of being any longer a tonic to the body, becomes a positive depressant, and results in evil, not only to the muscular but to the nervous system as well.

"A course of exercise—say cycling—should be begun and carried on by easy stages, for if one does one's exercise as he would do a penance, depend upon it it is very far from beneficial. Never, therefore, try to do too much.

"Exercise is a tonic, and therefore benefit is not to be expected from a single dose. Its effects are gradual, and it must be taken with studied regularity, day after day, at the same time, and if one is in ordinary health the state of the weather should not be permitted to balk him. During the summer and autumn months a cyclist should be like the

busy bee and improve each shining hour—he will thus lay up for himself a store of health that will stand good until spring-time comes again.

"Exercise ought to be taken in clothes which are neither too cumbersome nor too heavy; and, if heated, in the intervals of rest be very careful you do not catch cold."

Now, it is not too much to claim, cycling meets all the conditions of a perfect exercise in a degree approached by nothing else.

It is necessarily in the open air; and this is of great importance, because a prime object of exercise is to secure and lay up a store of oxygen, as has already been shown, which can be fully accomplished only out of doors, It also gives constant change of scene and thought, avoiding the monotony of indoor exercise. New rides, fresh sights, varied routes, pleasant companions, and absolutely complete change in every respect from ordinary occupations, give it very exceptional advantages.

It is an exercise of the class which has been shown to be most beneficial. It does not develop any one set of muscles excessively, but it acts upon many sets simultaneously, gently, and beneficially. It calls into simultaneous action more muscles than does any other form of exercise; but it calls them into play so gently and pleasantly that after one has gotten over the surprise that this unexpected occurrence gives him at the start, he is not conscious of the fact, except as he feels exhilarated after a ride, and finds every function made more vigorous and active. The chest, arms, and abdomen are the first to feel the effects

and benefits of riding a cycle. As in other exercises of speed, the chest is strengthened and enlarged; the arms and fingers become firmer in action; and every function of the various organs feels a vivifying impulse, and begins at once to act with unaccustomed vigor.

It requires but a short ride to start a sluggish circulation into healthy activity, to quiet strained nerves, refresh wearied muscles, and clear the clouded brain. It is well-nigh impossible to be so wearied, physically or mentally, that half an hour on a bicycle will not refresh the system like food and sleep combined, and impart to it a far better and more lasting tone than any stimulant can produce. A *daily* ride of an hour, or half an hour, if taken briskly, will cure dyspepsia even of the most confirmed sort, and make it possible to take any food with comfort. After an evening ride, and rub down or bath, the sleep which follows is as certain as it is incomparably calm and refreshing. The nerves are quieted, the muscles rested, the circulation stimulated, and the feeling of physical satisfaction which pervades the system insures calm and invigorating sleep. All this has been proved over and over again in the experience of every wheelman. Physicians are beginning to recognize it, and are recommending the wheel to both men and women. For indigestion, insomnia, and nervous troubles it is the sovereign remedy.

A characteristic feature of cycling, and one which belongs to no other form of exercise in a similar degree, is that it is suited to persons differing

widely in physical condition—in other words, the exercise can be made gentle, moderate, or violent at will. Of course, the process of learning is apt to be a little tiresome ; but, that over, the exercise can be regulated at pleasure. In this connection, a peculiar advantage is that *gentle* exercise on a cycle produces better and more lasting results than does any other gentle exercise. On this account it is simply unapproached as an exercise for women ; it seems to be suited to their needs in a most remarkable degree, and to furnish them with precisely what they require to build up their health and strength.

When moderate exercise is required, it is obtained by taking a longer ride or a faster pace, or the two combined ; and violent exercise can be had by still farther lengthening the ride and increasing the speed. These simple changes adapt cycling to all needs. In its gentlest form, a rider will travel four to six miles an hour, or nearly as fast as an ordinary horse trots ; in a moderate form, he will travel seven or eight miles an hour, or faster than nearly all horses trot ; in a brisk form, he will ride nine or ten miles an hour ; and, in a violent form, from twelve to fifteen, or even more.

Sometimes persons who have never ridden a cycle, and know nothing of its remarkable physiological effects, will assert that it is inferior to horseback riding, both as an exercise and a pleasure. But those who have tested both thoroughly know that this is not so. It cannot for a moment be pretended that horseback riding does or can

offer the advantages or produce the results already enumerated, which follow with certainty the regular use of the wheel, and which are testified to by thousands of its users. Moreover, as to pleasure, the motion of the wheel is far and away more exhilarating, as it is more smooth, even, and harmonious. However slowly one travels, there is always the same agreeable motion, far removed from the listless walk of a horse, which constitutes a considerable portion of horseback riding. The other gaits of a horse are too violent to be long kept up by horse or rider. At best, the exercise is variable and more or less violent. How different is the wheel, which is uniformly gentle, pleasant, and exhilarating, and infinitely more certain and beneficial in its effects.

In further confirmation of the claims already made are the following statements from physicians. They are experienced and practical cyclists themselves, and in their professional practice have had large opportunities to observe the effect of cycling on all ages and conditions as well as on both sexes. Dr. T. N. Gray writes:

"How and why does cycling do so much for the system? I have often answered this, or similar questions, in a general way; but I think I can give an answer from a physiological standpoint, which will satisfy the most captious of the value of cycling as a health preserver and renewer.

"Start with the accepted fact that exercise out of doors is beneficial to the general system. No argument is needed to establish this, as a comparison of the general health of the outdoor and indoor worker

is invariably in favor of the outdoor worker. The causes which work against the general health of the indoor worker are many, but they can be grouped under three heads: lack of fresh air; mental work, without a corresponding amount of physical work; and routine work.

"Two, at least, of these three general causes are always at the bottom of the lack of full health of the indoor worker. The result may be apparent in the muscular system, the organic system, or the nervous system, and consists of a loss of balance between the three systems. This loss of balance is rarely seen in the outdoor worker, and when seen is the result of excessive physical exercise. It is the natural conclusion that the cause which maintains the health of one class (exercise, or work, in the fresh air) can be used to restore the lost health in the other class, by building up the muscular system; by relieving the organic system, through a hastened circulation, and excretion through skin and bowels, and kidneys and lungs; and by resting the nervous system with a varied and exhilarating exercise. So is the 'how' answered, for cycling is only outdoor work or exercise.

"But 'why' cycling particularly, you may ask. Simply because, to my mind, cycling, as an exercise of use to the physician in treating his patients, both in the quality and quantity it gives, combines physical exercise, and mental and nervous exercise, as does no other form of outdoor exercise, and this without a single injurious quality. The rider of a wheel takes exercise in the most even, steady way I know of, and never does he injure his general

system when riding (scorching is not riding). The peculiar effect of cycling upon the nervous system cannot be put into words. The effect on the patient is plainly evident to the physician, and appreciated by the patient. It comes from an exhilaration which is peculiar to the wheel. Every rider has felt it. He may not appreciate it now, because he is accustomed to it; but let him stop his riding, and the result is soon apparent in sluggish memory, or annoying organs, or easily tired timbs—in short, a loss of balance. I have had results from it in practice that I have never had from any other form of exercise, and never have I had it fail in doing good; and, without decrying other forms of exercise, it, I repeat, combines muscular exercise with mental and nervous exhilaration as does no other."

Another letter is from Dr. F. A. Kinch, Jr. He says:

"Whatever I may have written in the cause of cycling I fully emphasize by this writing. When indulged in in moderation, it is invariably for the good of the participants. I do not for a moment consider any tests of strength or speed, for those who are not trained for such work have no energy to spend in that way.

"As to the 'how' and 'why' it is for so much good! Any exercise that brings in play the greatest number of muscles, and exercises them evenly, is the best to take. This is found in cycling; no one muscle, or set of muscles, is overtaxed in riding. Also, it takes the cycler out of doors, where fresh air and plenty of it can be breathed; it gives him or her a change of scene; the change of land-

scape adds pleasure to a ride, and before the rider knows it he is wheeling along enjoying the country, while his muscles are getting the benefit of the ride. That the rider loves the sport I consider a very great aid to its success, for no form of exercise will be beneficial if it is not thoroughly enjoyed; you can expect the greatest result from that sport which the player or rider enjoys most.

"Professional experience has shown a number of cases under our own care that have been benefited by cycling. Weakly boys and girls grow strong while riding a wheel. A remarkable case may be worthy of notice. A young man, about eighteen, was taken sick with diphtheria; he had previously ridden a wheel; he was very ill, and when recovered some thought he would have heart disease. He was very carefully watched, of course. The question came up, Should he ride his bicycle? He was an intimate friend of mine, though not my patient. He asked me what I thought, and I told him to take a short ride with me. He did well, and continued riding carefully, and a little more each time, until he really rode back to health and strength. Now he is a strong, well man, and thanks the wheel for the sound physique it gave him. This is only one case, but there are more just like this one.

"In conclusion I would say ride a cycle; ride in moderation; enjoy the wheel; and all who do so will enjoy better health and be happier; the cares of life will be easier borne, and your life will be lengthened."

The peculiar and exceptional advantages which cycling offers as an exercise for women are not

matters of theory with the writer, as he has had in his own family several very striking illustrations of its remarkable effects. In further confirmation, however, of his statements, is the following letter from the pen of "Pysche," a well-known contributor to wheel papers. It was written in response to the query, "What does cycling do for women?"

"Is wheeling a desirable thing for women? Yes, emphatically! This is rather an uncompromising position to assume; but an ordinary, every-day experience makes me feel that on this question there are not two sides, or, if there is a side other than the affirmative, it is so small as hardly to be noticeable.

"For three years I have been a practical wheelwoman; first, a tricyclist, and then, when the bicycle came for women, an ardent and enthusiastic bicyclist.

"In my own family one person has been restored from a state of semi-invalidism to normal health, and two others (one of them myself) have been kept in such a state of health as few American girls can boast of, and this I confidently believe to be due entirely to the fact that we are a family of wheelwomen.

"A friend of ours, who was afflicted by 'nerves,' fainted on any reasonable or unreasonable opportunity, wept quarts in the month, and wished she was dead more or less all the time, was inveigled by us to try our prescription. We told her to get the sanction of her physician, lest we should perhaps do her some harm, for we all regarded her as suspended on the edge of the tomb, and did not

want to meddle if there was any chance of doing harm rather than good. Her physician, like a sensible man, gave her his blessing, and told us to begin.

"Well, we did, and I wish I could illustrate this letter with a picture of her before and after. That was nearly a year ago, and though she is not as strong as I (for I yield that palm to none), she is far beyond the average girl. For example, she rode thirty miles, actually in the saddle for that distance, on a dirt road with me yesterday, and came home a little tired; but this morning woke 'as fresh as a daisy,' and ready for more. She cries yet sometimes (all girls do); but her nerves give her no more trouble; she has grown fifteen pounds heavier; is bright and jolly, and as enthusiastic a wheel missionary as anyone ever was or will be.

"A girl I know is a teacher, and a very hard worker. She got completely run down last year and, hearing of somebody who had been benefited by wheeling, thought it worth the trial. She says that toward the end of the time, before she began to ride, she pitied her scholars, for she simply couldn't control herself—she was wild.

"She is another shining example of what a wheel can do, for she finds herself easily able to keep up with her work, is in thorough sympathy with her scholars, and on Saturdays goes off escorted by some of her boys on their wheels, and has no end of a good time.

"Just one more example—one I have already spoken of in the *Wheel*, and one which was more

pointedly a bicycle cure than anything I ever heard of.

"This girl I know well. She is a very clever musician; very ambitious and untiring in her work. Besides practicing anywhere from six hours a day up, she filled up the chinks with lessons, and played at a concert or two. After three or four months of this she began to suffer from sleeplessness, and it got to such a pass that the doctor stopped her music, shut up the piano, and forbade any hearing of music. This did no good. Then they sent her to the mountains; this failed. The doctor prescribed a bicycle, but her mother would not consent, thinking something ought to be found less objectionable and just as powerful. They went on trying, and the poor girl went on suffering. This lasted for two months and over. She told me that she could think of no torture she would not go through to be able to fall asleep as she used to do; but she got no rest except through the use of opiates. The doctor at last told her mother that he really thought the wheel so much worth trying that if she refused her permission he would throw up the case; so she succumbed, and the girl took a lesson. It was her last hope, she said, and if there was anything in it she proposed to find out, and waste no time learning to ride; so, for the whole enduring day, she toiled away at the school, hot, tired, triumphant and despairing by turns, and only went home when the teacher rebelled. Then she went, used up, and lay down to rest, not to sleep—she didn't hope for that; but in ten minutes was 'fast as a church,' while her

mother almost wept with delight, and the whole family stood round to keep things quiet.

"Of course, after this her mother had nothing to say that was not in favor of her riding, and she rides all the time.

"The last time I saw her I asked her if the wheel still stood by her, and she said she finds that if she does not ride for a week or so, she does not sleep well; but while she rides regularly no one sleeps sounder or better than she.

"There are three people, personal friends of mine, who have been inestimably benefited, and I know of lots of girls who say that they don't know what it is to feel ill any more, and give the credit all to their wheels. If this is my experience, and only in a narrow circle of acquaintances, just multiply it by others and see what a tremendous sum total there is in favor of wheeling for women.

"Of course I don't mean that if you don't ride a wheel you will die or grow up an invalid. If you are lucky enough to have plenty of leisure, and have sense to make good use of it, you can be probably as strong and well as a wheelwoman; but you will have to devote a good deal of time to it. Wheeling calls the muscles into play more thoroughly and more gently than any other one form of exercise. It is far ahead of gymnasium work, because it is bound to be taken in the open air; far ahead of riding, because it brings more muscles into gentle action; and better than tennis, because not so violent.

"Look at the girls who wheel, and see if they

don't, as a class, look happier and healthier than any other class you know of.

"As for fun, nobody knows who has not tried it what the delights of a country run are. Half a dozen wheels spinning along, the riders all overflowing with laughter and good humor, flying down hills, more like a bird in feeling than anything else; climbing stiffish hills and feeling your muscles 'swellin' wisibly.' Oh, there is nothing like it! Try it and see.

"I want to be a missionary, and go about making these poor girls, who don't know what a good thing life is, wake up and try what thoroughly good health and vigorous life means just once, and see if they don't crown the wheel with glory.

"Men can't conceive what a thing this wheeling is to us poor women. How can a woman be strong and well without exercise? How can she get it when it's 'unladylike' to run, and is (not so much nowadays) rather unwomanly to be able to take long walks.

"Our grandfathers' ideas that a woman could get all the exercise she wants about the house are *false, false, false!*

"Take making beds, for instance; is not that violent exercise enough for anyone? If you want some exercise, arrange your own room.

"Making a bed does not in the least hurt me now, but before I rode, it *did;* it made my back ache and my knees tremble, and I decided that I did not need any of that kind of exercise. Now my muscles are a little stronger I can do it without evil effects.

"Sweeping used to be held in high repute also. Any more one-sided thing couldn't be imagined. It is simply injurious, unless you are strong, and can stand the exertion, and be well and strong in spite of it.

"I don't want anyone to think I am preaching against a woman doing all that is necessary to keep her house as it should be, and think she ought to be proud to be able to make her own beds, and sweep her own house, if her husband's position is such (or her own) that this comes in her line of duty; but I do say again and again, it is every woman's duty to be as well and strong as she can be, and in order that she may be able to do her duty easily and well she must be strong and vigorously well. To be this, she must have exercise; and the easiest, best, and most surely successful way to do this is to ride a bicycle and ride it regularly."

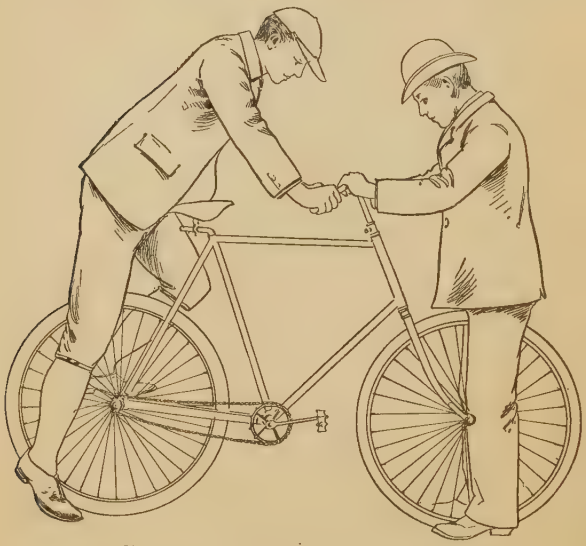
CHAPTER II.

LEARNING.

N the cities and larger towns there are usually to be found one or more schools, academies, or instruction halls in which any person can be taught to ride a bicycle, usually at a charge of fifty cents for a half hour's lesson, or five lessons for two dollars. At the end of five lessons some persons are able to take a road lesson, accompanied by an instructor or some friend, while others will prefer to continue their indoor practice with perhaps another course of lessons. When a person learns in this way, he receives his elementary instruction from a practical and experienced teacher, and ought to make good progress. But it often happens that, for one reason or another, a person prefers to learn directly on the road, and frequently this is the only practicable way, especially in small places where there is no school.

In case of learning out of doors a smooth, level piece of road should be chosen, and a cycling friend secured to give assistance. He should steady the machine by means of the handle bar while you mount, and should then hold the bar firmly with one hand while with the other he grasps the saddle spring or lower part of the saddle.

In this position he can completely control the machine, and render a fall almost an impossibility. Should a violent and unexpected swerve occur, so that the machine actually falls, simply hold out



HOLDING FOR LEARNER TO MOUNT.

your foot on the side toward which you are falling, and you will come down safely. The instructor should walk by your side, holding the machine as described, and assist you in your efforts to steer it, at the same time offering suggestions and giving advice. Frequent rests should be taken, and from but fifteen to thirty minutes occupied with each of

the earlier lessons, according to the strength of the learner.

A bicycle is maintained in its upright position through balancing it by means of its steering-

ASSISTING A BEGINNER.

wheel. It will not stand alone, because its balance is not then maintained through a change of position of the steering-wheel ; but, place an expert rider in the saddle, and he maintains the balance by turning the steering-wheel an almost imperceptible distance to one side or the other, and at the same

time can move ahead at a gait so slow that a novice, on attempting it, would immediately fall from his wheel. The balance of a bicycle is maintained by turning the steering-wheel in the *direction toward which* you are *falling*, which action

DISMOUNTING.

inevitably restores the equilibrium of the machine. The natural impulse of a learner is to try to avoid a fall by turning the wheel away from the direction toward which he is conscious of inclining. This is a case in which the natural impulse is wholly wrong, and learning to steer is simply learning to overcome this first impulse, and to develop by practice a new and different one. If the novice is assisted by a friend, he will learn advantageously,

because the assistant will aid him in his first attempts at steering, and will constantly repeat the directions which nearly every novice, in his earliest efforts, is pretty sure to keep forgetting.

PRACTICING STEERING WITHOUT PEDALS.

If the learner has a friend who will continue to give him assistance until he can ride alone, he is well off; but if he has not this advantage, or wishes additional practice, he can make the trial alone. In this case the pedals should be removed, and the saddle placed so low that the learner's feet

touch the ground. Then grasp the handles, and get the machine into motion by pushing on the ground two or three times with each foot; lift the feet from the ground, and endeavor to steer the machine so that it will continue erect until it loses its momentum. Repeat this for some time, with occasional rests. You will in this way become accustomed to the sensation of restoring the equilibrium of the machine, after it seems lost, by turning the handle bar, and so acquire the first practical experience in independent steering. When you find that you can actually steer well enough to keep the machine erect for a few yards, you can make the work easier by getting a good start, and then putting your feet upon the coasters. Hold the bars firmly, and steer steadily, and should you fall it is very easy to put out one foot and save yourself. A little practice of this sort will soon enable you to steer quite independently.

When you are able to keep your feet on the coasters and steer the machine steadily until it loses all impetus, it is time to replace the pedals. The saddle, however, should still be kept low, as, in case of a slip or fall, the foot will reach the ground more readily.

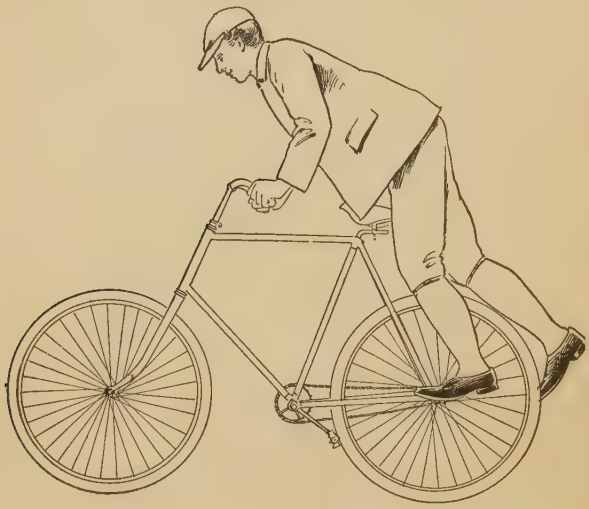
The next thing is to learn to balance the machine from the step, preparatory to mounting it. You must stand behind the machine, leaning forward and grasping both handles, then place your left foot on the step, and put the machine in motion by hopping two or three times with your right foot. In doing this, you must keep your machine erect and straight by turning the steering-wheel very gently

from side to side. After a few hops, you should rise carefully on your left foot, thus carrying all your weight on the step, and see how far you can maintain the balance of the machine, always remem-

PREPARING TO MOUNT.

bering to turn *toward* the side to which you are falling. The first attempt will probably be an utter failure, and you will have to jump off from the step and try again. It is tiresome work, but it is necessary practice, and you must persevere in it; but only a few minutes at a time, and with frequent rests.

When the learner can preserve his balance on the step, and ride a little distance standing on it, he should lean a little farther forward, move his right leg along till it rests partly over the saddle,



PRACTICING ON STEP.

and then slide gently forward on to the saddle. He must not give a spring or jump in taking the saddle; but should rise slightly and gently on his left foot, and when his right leg reaches the saddle slide forward smoothly on it to a comfortable position. While reaching for the saddle, he must not forget that the balance of the machine depends more than ever upon his proper steering. The

better the mount he makes, the less is the steering affected, while a jump or lurch into place will make the machine wabble.

As soon as the rider is well on the saddle he

TAKING THE SADDLE.

must feel for his pedals, in order to keep the wheel in motion. He must keep up a motion, though a very moderate one; for a novice, being a poor hand at steering, finds either a very slow or very rapid pace practically impossible. Probably, on gaining the saddle, the novice can ride but a few feet, when his power of steering will seem to

desert him and he will topple over to one side, when he can alight easily on his foot, taking care however to keep the pedal from striking the ground. It is merely want of practice. He

PREVENTING A FALL BY ALIGHTING ON ONE FOOT.

should rest a few minutes and then try again, and repeat the process a number of times. Remember, however, not to continue it until very tired, and do not be discouraged if you seem to make no progress in the first lesson. Take *short*

lessons, one or two a day if convenient, and you will soon learn. After something of the knack of steering is acquired, a little persistent, independent

TEST FOR PROPER REACH.

work at the step and in mounting will enable you to begin riding.

When it is possible to ride a block or two, it is desirable to raise the saddle about *half an inch*, and this should be repeated at every third or fourth ride until the proper height is reached. On no account raise the saddle much at a time, for it has

some effect on the steering, while the difference in position and reach makes a beginner more or less uncomfortable. The proper height is readily

MOUNTING FROM CURB OR STONE.

told, for, when the pedal is at its lowest point, the rider's heel should just comfortably reach it.

Mounting from the step is always practicable, and is the best all-round way, being easy for the rider and not likely to strain the machine. But if one happens to be starting off from a curb, it is often convenient to place the outside pedal slightly

forward of the highest point, sit upon the saddle with one foot on the raised pedal and the other on the curb, and then start off by pushing on the curb with one foot and pressing down on the outer pedal with the other. This is easy, graceful, and desirable when starting off from a curb. Mounting from the pedal is not desirable on light wheels, as it strains and racks the frames as ordinarily practiced.

A woman may learn to ride in a school or on the road just as readily as a man, and as a matter of fact often more quickly. Capable assistance is very desirable, however, for many women who especially need the exercise have so little strength that they require considerable help at the start. The method is the same as with a man, only the care and attention should be a little greater. The instructor should place the machine in position, with the right pedal a little forward of the vertical. He should then hold the handle-bar firmly, while she grasps the handles from the left side, places her right foot on the right pedal, and rises to the saddle. When she is properly seated he should grasp the handle-bar and frame in the way described for teaching, and all is ready. The instructor walks along on the left side of the machine, steadying it with his right hand and assisting in the steering with his left. The rider must pedal slowly, in order to enable her assistant to keep pace with her and to keep her steady. She must watch closely the effects of her attempts at steering, and follow carefully her instructor's directions. Very frequent rests must be taken, as

it is tiresome work at the start, and the first lessons should be short ones.

In case the learner wishes to take independent practice, she can, as already described, remove

LADY LEARNING TO MOUNT.

the pedals, lower the saddle, and get a knack at steering on her own account, the same as a man; but not quite so conveniently, as her skirts will somewhat interfere with the attempt.

The next steps are to learn to dismount and to mount alone. In the first lessons the learner is helped to mount by her assistant; but as soon as

she is able to ride a short distance alone, she will sometimes find it necessary to dismount without help, so that point is first considered.

The simplest way to get off the machine is to slow up until you are just moving, then apply the brake and, as the machine inclines to one side, reach for the ground with the foot on that side; as the foot touches the ground, draw the other foot through after it, taking care to hold the handles steadily and prevent the pedal from striking the ground. You will perhaps be told that this is no "dismount" at all, but simply falling off; if you are so informed, never mind it; it is practically unavoidable at the start, and sometimes necessary afterward; and, as a matter of fact, is often convenient.

The regular and a graceful dismount, however, when well done, is to ride very slowly; apply the brake as the left pedal reaches the lowest point; bear all the weight upon the left foot as you stop, carrying the right foot through to the left side, and so stepping off upon the ground on the right foot. It requires a little care to do this well, but it can be learned with patience.

In order to mount alone, a novice can go to a curb or a large stone. If this is tried, care should be taken not to start with a jerk which will swing the steering-wheel around; but to push off firmly and evenly. The usual method is to stand close to the left side of the wheel, holding the handles firmly, with the right pedal just a little forward beginning to descend, as already described for mounting. Put the right foot over upon the

pedal ; adjust the dress to hang evenly, and then rise to the saddle by bearing your weight upon the right pedal. By this action you reach the saddle, and also put the machine in motion. It must be

DISMOUNTING.

done quickly, but evenly, and without a jerk or jump. You will feel the machine begin to move forward as you rise, and you must pay attention to the steering. Probably the first attempts will not seat you comfortably ; it will be necessary to practice it until you can reach the saddle with skirts

hanging properly, and without having the wheel wabble all over the road.

A more difficult, and seldom used mount, is to stand as before on the left side of the wheel, but

MOUNTING.

with the *left* pedal raised. Put the left foot on it, and rise on it, and as it begins to descend swing the right leg in between the left leg and the saddle, and rise to the saddle. This, like the pedal mount for men, is of no great utility.

In learning to ride a great thing is to make haste slowly, and not overdo. This may seem painfully

simple, but experience shows that the caution is required. So many muscles, ordinarily unused, are brought into play that, unless the first rides are very short, the whole system becomes fatigued. It should be regarded as an imperative rule, in the first two months of practice, to never do enough to become really fatigued.

The secret of rapid learning and of acquiring facility in the use of a cycle is in taking frequent, regular, and short rides, aided, if possible, by a rider of judgment. Remember that it is not brute force, but skillful management of a wheel, which makes riding easy and pleasant, and secures speed as well. The method of taking short daily rides will produce the best results; the muscles will steadily strengthen, and the improvement will be rapid.

The first ride should be, if possible, under the direction of an experienced rider. It must be taken very slowly. Half a mile is long enough for many to undertake. A mile is sufficient for the average person, and a mile and a half is far enough for many a man. The second ride should not be any longer; but it may be taken a little more rapidly. The increase for the first week should not much more than double the distance ridden the first day.

In the second week the same gradual progression should be adhered to, and about twice as much ground covered as was in the first week, provided that on no occasion the rider goes far enough to become particularly tired. This must be remembered. It takes a week or two to get

the muscles accustomed to the exercise, and to acquire familiarity in the control of the wheel. After the second week, rides can be lengthened according to the rider's judgment; but six to ten miles is quite far enough to attempt by the end of the first month. If the rider is a woman, and was not in good health on beginning, she will do well to then be able to ride five or six miles comfortably. A man, unless an invalid, ought to do ten miles.

There are two ways of riding—at a uniform gait without a stop, and to vary the gait and occasionally rest. The first method covers a given distance in the shorter time, and gives better results. The other method is easier, and often pleasanter. Hard riding is seldom advisable, and during the first few months should never be attempted; but an effort should be made not to fall into a slovenly style. At first, occasional rests should be taken; but, after a few weeks, it is well to set a moderate pace and endeavor to maintain it for a time. More good results from fairly brisk exercise taken in this way than from long, irregular rides.

For some time it is well to avoid all grades, as they only discourage a novice. After that, try the hills by degrees. Take a gentle rise at first, lean forward a little, and add your weight to the pressure on the pedals. If you cannot mount the hill, notice how far up you ride, and try again next day. After a few attempts you will reach the top. Some people avoid hills, but very foolishly. Practice in hill climbing is strengthening. Make it a point to take a hilly road now and then; it will do

the muscles lots of good, and pay many times over for the exertion.

After you have ridden a month or two you can try your first coast. Take a smooth and gentle hill; place one foot lightly on the coaster, and pedal carefully with the other. The machine will be a little less steady than usual, but if the hill is not steep, you will have no trouble. Next time, try the same thing with the other foot up. Try it several times with each foot before you put both feet up. Hold the brake partly on from the start. Do not allow the machine to run very fast and then try to check it. Keep it at a moderate gait *from the moment you begin to move*, by means of a constant pressure on the brake. Start with the machine under perfect control, and keep the brake on sufficiently hard to retain your control. You can, after a few coasts, reduce the brake pressure and ride faster with safety. Be sure, however, to do this by degrees, and do not attempt suddenly to coast without the brake. No rider can safely start free on an unknown or dangerous hill.

Don't try a steep hill until you are used to gentle ones. At the end of the coast, take down your feet carefully, taking care to steady the machine by the handles. Coasting is so fascinating that it sometimes leads to recklessness; but if you never coast where you cannot safely pedal, and never risk a strange hill when you cannot see the bottom, there is very little to be feared. Do not coast a hill that has vehicles on it. A cycle has only the rights of other vehicles, and no right to go flying down forcing anyone out of the way.

Moreover, the sudden twists sometimes required to pass vehicles, especially if the road is narrow, are not safe when coasting rapidly.

To slow the machine, and to stop it under all ordinary circumstances, it is necessary to learn to back-pedal. To do this, sit straight and begin to put a gentle pressure upon each pedal at the very lowest point, just an instant before it begins to rise. In riding down a steep hill, the control of your wheel depends largely upon whether you can feel and hold the pedal at that peculiar point. If you cannot, the reach is too long for you, no matter how short you may think it when riding on the smooth level. But the first attempts at back-pedaling must be on the level, and must be very moderate. The power applied can be increased by degrees. An expert back-pedaler can stop in a very short space by this means alone.

Learn to use the brake. It is often needed in descending hills, and to slow the speed in coasting. Apply it very cautiously at first, but practice with it till you can use it comfortably. Never take an unnecessary risk. Keep the machine well in hand.

It is highly important, in learning to ride the bicycle, to endeavor to acquire skill and facility in its use before you attempt to cultivate strength and speed. If the novice is painstaking in his riding for the first few months, and careful to learn to do well every little thing in the management of his wheel during the first season, he will secure the best results and obtain good control of his wheel. Let him keep a cool head, always stick to his wheel to the last, and if he rides with any judgment, his

wheel will stick to him. He will also find that his strength greatly increases, so that, when he begins to attempt a faster gait, he will be able to improve rapidly.

When mounted, sit up straight and well back. Unless for special cause, like racing, riding against a high wind, or mounting a hard hill, it is best to sit erect. Do not grasp the handles like a vise, but hold them lightly. When you can steer with a light grasp, practice steering with only one hand, until you can control the wheel easily in that way. When that is acquired, remove both hands from the handles for an instant, taking care to press evenly with the feet. If the wheel swerves, a little pressure on a pedal will right it. Practice this a little at a time, but often, and you will soon be able to ride, hands off. This accomplishment is not for show, but to give a good control of the wheel, and will teach you quickly the importance of even pedaling. Most persons pedal more or less unevenly, exerting greater pressure with one foot than with the other, and this, of course, tends to deflect the wheel from a true line. Steering with the hands counteracts this tendency more or less completely, but a man who does all his steering with his hands rarely, if ever, rides as true and gracefully as a man who can steer perfectly with feet alone. By practicing diligently, hands off, a little at a time, perfectly even pedaling can be acquired, and a man can ride long distances on good roads without touching his handles.

Rides should, if in any way possible, be taken daily, be they never so short. What has been said

about learning has been based upon daily practice. If rides are taken less often, it will take proportionally longer to learn. Proficiency is secured only by regular practice. In order to ride well, you must ride frequently. To derive benefit from it, you must ride regularly. Though occasional and irregular riding may be beneficial, it cannot produce the marked and lasting effects that regular riding insures. It is best to learn to ride on a single machine, not depending on another's aid on a tandem. You will thus acquire independence and self-control.

These directions will, *if rigidly followed*, enable even a delicate woman to gain good riding power in a few months' time. A man need not begin quite so slowly, but he should follow out the same line of practice, and adhere to the principles on which it is based.

CHAPTER III.

RIDING AND TOURING.

A PERSON who has just acquired the power to propel a bicycle without falling cannot really be said to know how to ride it. To acquire the ability to propel it at all is, of course, the first step ; but it requires considerable time and careful practice to learn to ride effectively and well, and a number of weeks of regular work must elapse before any considerable distance can be ridden, or any great speed attained without over-exertion on the part of the rider. On beginning to ride, the temptation almost invariably is to lengthen the distance or increase the speed before good facility in the management of the wheel is acquired, or the muscles have become accustomed to their work. This is apt to lead to a slovenly manner of riding and, if carried too far, may result in accidents, or prostration from over-exertion. These evils can be entirely avoided by *making haste slowly*.

To become a good rider requires patience, careful attention, and regular practice. Many wheelmen, it is true, become good in certain points, but not many ever become proficient in all respects. A few learn to ride in good general form, or at least without any glaring fault ; a few become

strong, steady goers, capable of sustained effort; a few are good hill climbers; a few get pleasure out of any road that comes, and a very few indeed learn to ride with proper ankle action. The man who becomes accomplished in all these ways is a *rara avis*. It is not until a little attention is given to the matter that it is possible to realize how deficient very many riders are in some of the little acquirements that belong to the make-up of a really proficient wheelman. It can be readily tested. Think over the points necessary to make an ideal rider, and then notice everyone you see on a wheel. The result will be a revelation, and form in riding will prove an interesting study.

A common cause of poor riding has been from having too long a reach, and it is only lately that wheelmen have begun to appreciate the increased power, more perfect control, especially in bad places, easier hill climbing, and greater degree of pleasure that follow from having the pedals well within the reach. These are advantages that need only be mentioned in order to be appreciated; and now that it is realized that they result from a moderately short reach, the tendency of some is to go to the other extreme and set the saddle too low, and so really lose power from contracted muscles.

What is to be sought is a perfect fit, and that is obviously one that will give the rider the maximum of power and the most perfect control of the wheel. The maximum degree of power can only be secured by having a reach short enough to enable the rider to apply power effectively at every available part of the stroke. This means something different from

the direct, vertical thrust which is all that a large majority of riders ever learn. It means a reach so short that a good ankle action will have the toe far enough below the pedal, when it is at its lowest point, to enable the rider to continue his application of power backward beyond that lowest point. It also means a reach so short that on back-pedaling down a steep hill the pedals are felt perfectly, and held steadily, at the very lowest point of every revolution. The test for both cases is the same: the rider should be able to place his heel easily on the pedal when it is at the lowest point. This position can be readily found as the saddles are adjustable, and not too high a frame should be bought.

In securing the reach which enables the rider to apply his power to the greatest advantage, he also obtains a reach which gives the best control of the wheel. Complete control enables the rider to take bad spots and country roads more readily, to climb hills with lessened exertion, to steer with increased freedom and less dependence on the arms, to economize generally in expenditure of power; and to give himself and machine the minimum amount of jar. This is accomplished by having the reach so short that the foot can exert full pressure at the lowest point of each stroke; and by riding well on the pedals, instead of sitting (or hanging) on the saddle, especially over all rough and bad spots.

Moreover, the rider should be able to pedal his machine while standing on his pedals, with his body entirely clear of the saddle. Of course he should clear the saddle but a trifle, for his leg

should get very nearly a full stretch at every stroke; but a full stretch by no means implies that the toe should barely touch the pedal when the leg is extended. If the reach is too long the rider usually will not be able to clear his saddle while pedaling; or, if he can, he will be riding delicately on his toes without a firm grip of the pedals. The longer for the rider the reach is, the weaker becomes the grip of the pedal that the toe can get, and the more is the rider compelled to trust to the momentum of the machine to pass over obstacles. The inclination to trust to momentum is a defect common to beginners, and to nearly all who ride with too long a reach. A rider on a wheel which fits him can push the pedal all the way around on each revolution in a bad place, and depend upon this *complete and continuous* control of his machine to get through; his machine obeys him, and he obtains confidence—there is nothing like a good fit, and pedaling all the way, to give one confidence. But the rider who has too long a reach is obliged to depend largely upon momentum to carry him over bad spots: he can never know just how he is going to get through; he becomes more or less nervous; is in dread of a fall, and never gets the greatest pleasure out of his wheel.

Besides the advantages just considered it is the same reach that gives the maximum of power, and complete control at the lowest point of each revolution of the pedal, that makes it possible for a rider to acquire almost perfect control of the steering by feet alone. This is not suggested with a

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view to attempting any fancy feats whatever. It is, however, always practically useful to have a wheel under the most perfect control; and ability to have both hands free may be of use, especially if one rides in cold weather when the ears and fingers tingle.

After one has become a fairly good rider and can do twenty or twenty-five miles with comfort and enjoyment, he should begin to take short rides on country roads, At first the best roads should be chosen, and narrow side paths avoided; but after a little experience the roads should be taken as they come, if one really cares to become an expert all-round rider. Narrow paths, ruts, sand and loose stones will prove very annoying at the outset, but soon lose all their terrors if this kind of riding is kept up. On narrow paths a careful watch must be kept for stones and roots of trees along the edges, for pedals are liable to encounter such half hidden obstructions. If in a rut, simply run straight ahead, holding the steering wheel straight, till a point is reached where the edges permit turning out without causing a fall. It is easier and safer to run along in many ruts, devoting all one's attention to keeping straight in their center, rather than attempting to turn out at a point where the sides are high enough to impede free turning. In crossing ruts, car tracks, and the like, take them nearly at right angles; also slightly increase your pressure, but not your speed, as the increased pressure steadies the machine. This also applies with equal force to passing over any bad spot, and to turning.

The secret of getting at the truest pleasures of the wheel is to learn to master thoroughly the mount chosen, so that the rider feels at home on it and is able to ride anywhere within the bounds of reason. To accomplish this, considerable attention must be paid to many little details at the start, at which time it is just as easy to form good habits as bad ones, and the habit of riding in good form can be readily cultivated. For several months at least, and preferably for nearly all the first season one rides, attention should be turned to acquiring skill; speed and endurance are yet of minor importance, and, moreover, one can become proficient in both of them far more quickly if there is first acquired a good degree of skill in manipulating the wheel under all ordinary circumstances. It is difficult to lay too much stress upon these considerations, because they are so often ignored. The published reports of speed and endurance on the wheel are apt to rouse in the novice a spirit of emulation which, though frequently desirable, should be controlled at least until skill is acquired. When a rider becomes really skillful, speed and endurance can be safely cultivated by means of a training more or less complete according to the objects in view.

When one has first really learned to ride, the runs should be brief ones, and as much attention and energy should be expended in acquiring good form as in the propulsion of the wheel. The quality of *good form* is equally valuable for its effect upon the rider and the observer—it enables the former to get the utmost out of his wheel in

every way, and it convinces the latter that cycling is most easy and charming. Good form is usually the result of mastery of the wheel, aided by a good machine, and is practically impossible to one who has incomplete control of his mount; it is the easy grace that one acquires in a position of which he is the conscious master.

In order to cultivate good form, the reach must be of the proper length, already insisted on, and the handles carefully adjusted as to height, and not so long as fashion has sometimes demanded. The principle of a comfortable reach for the arms is to have the handles at such a height and of such a length that the hands will drop naturally upon them a little in front of the body, and but little to each side of it, while the rider is in the saddle with feet on pedals. The rider should be in an erect, easy position, with the elbows but very slightly bent. For this purpose a bar not over twenty-two inches from tip to tip should be used; twenty inches is long enough for most persons, while experienced riders as a rule prefer even a little less than this. In position, the handles may be, for a man of ordinary size, two or three inches higher than the saddle, and for a woman perhaps four or five inches. An upright position is desirable, but comfort and grace do not require anyone to sit bolt upright as if tied to a post. On the contrary, a rider is more comfortable and graceful, and can use his power to better advantage, if the body is slightly flexed at the hips, with the chest a little thrown forward, with the shoulders well back. This keeps the chest open, the lungs free, and

gives the most powerful working position. It is entirely different from the bent over, doubled up, and chest-contracted position assumed by so many, but is not the ramrod-like form that some think necessary in order to show disapproval of the other extreme. Such a combination of leg reach, arm reach, and body position will give the most comfort and power, and tend to reduce the inclination felt on a badly adjusted wheel to frequently change one's position.

The saddle also must be of good character and suitably adjusted. Nearly all are "universally adjustable"—that is, the tension of the leather can be altered; they yield to the form of the rider, and they can be raised or lowered at either end at will. Some little practice and attention are usually required in order to find just the position where one does not slip and is not chafed, and one should experiment until it is found. There is opportunity for some little fore and aft adjustment on the **T** or **T** rod which carries it. It is worth while for each rider to experiment for himself a little in this matter with regard to two points, viz.: Ease of propulsion (as the position is made more or less vertical) and steadiness of steering (as the weight of the rider approaches, or recedes from, the center of the driving-wheel). While the opinions of riders differ considerably on these points, those who have studied the matter and are entitled to be considered authorities are pretty well agreed that there is such a thing as too vertical action, and that power can be best applied from a position slightly in the rear of the pedals. The opinion of one of the first

English authorities, expressed editorially in the *Cyclist*, is as follows :

"If a machine is required for racing, either on the road or path, or for what is known as 'scorching,' pure and simple, the saddle may be placed a few inches back. For fast riding it is desirable. On the other hand, should a machine be required for ordinary road riding, more especially if the district in which it will be used is a hilly one, then the construction of the machine should permit of the saddle being placed so that a plummet dropped from the peak will fall on the center of the crank-axle. We may further explain at this point that the lighter and more powerful in the legs a rider is, and the more nearly he approaches 'form,' the faster will he be likely to ride, and the further back will his saddle be found advantageous ; but, on the other hand, for a man—more especially if he be a heavy weight—who rides perhaps once in a week, travels at a moderate pace and for pleasure only, and who is never really in an athletically fit condition, such a position would be absolute misery, and it will be a necessity for his comfort and ease in riding that he keeps well over his work. As to which of the two extremes, or as to what intermediate point will be more suitable for their individual requirements, our readers can best decide for themselves."

This very sensible advice was written at a time when the cycling fashion, or prevailing fad, demanded a very backward position—a position in fact which carried the saddle back nearly over the center of the rear wheel, and was a perfect

absurdity. But the reaction of course came, and riders soon jumped to the other extreme, and moved their saddles so far forward that many now really almost pedal backward, as they did on the now extinct Broncho and Eagle. The most sensible and practical thing, however, is to obtain a position midway between the extremes. As to the character of the saddle itself, if one rides as much on his pedals as he should, he will not require a large, heavy, and soft affair, but will be able to ride a reasonably firm one of moderate size, and get equal comfort without any loss of power.

With properly adjusted reach, handles, and saddle a rider is in position to practice to the best advantage, and ought to be able, if he is assiduous in his work, to acquire good form. He must sit erect, but not stiffly; he must rest easily and lightly on the saddle, with a good portion of the weight carried always on the pedals; he should acquire control of the wheel by feet alone, so that he can at any moment free both hands for use; he must ride accurately, so that he can pick his way between obstacles, with the rear wheel always following in track; he must pedal steadily and firmly and learn to spontaneously increase the pressure immediately on feeling that the wheel is passing over an obstacle or hole, and he must cultivate good ankle action. This array of virtues is not too formidable for anyone to cultivate, and each one well repays the rider for the practice and attention taken to acquire it.

If one is something of an athlete, he can natu-

rally take longer rides at first than one unaccustomed to exercise; but if one indulges in only one athletic sport, as walking, rowing, or running, he cannot presume too far upon his proficiency in that, and expect to be able to do a great deal more on the wheel, *at the start*, on that account. The cycle calls into simultaneous action a greater number of muscles than does any other exercise, and many of them are muscles scarcely used at all by the majority of people; consequently, on beginning to ride, it is well-nigh impossible to go too slowly. Of course no arbitrary distance could be judiciously assigned, as riders, roads, and opportunities vary considerably; but it is well to remember that short, regular, moderately fast rides are much more beneficial than longer, infrequent ones, and that no considerable distance, or high speed, should be attempted unless one is in regular practice. If one rides five to ten miles nearly every day, *part of it at good speed*, he will soon be in shape to ride fifty or even a hundred miles in a day without danger of overexertion; but if he rides only once a week he ought to take an easy gait and not attempt long distances, as ten to twenty miles will be all he is really fit for. On good roads, nine to twelve miles an hour may be called tolerably fast riding; from fourteen to sixteen miles is a really fast gait, and worth occasional practice for the sake of the wind and endurance it gives, while from seventeen miles upward is a road-racing speed. On poor roads, from one to three miles less per hour is probably about equivalent.

It is possible for a person quite out of proper

condition to perform some feat of marked endurance on the wheel, if he is a good rider; but it will cause overexertion and show injurious effects sooner or later, and, when one gets out of condition as much as the majority do during the winter months, riding ought to be resumed by degrees. In the few riding districts in this country where a wheel can be used nearly every week of the year, one can keep in fair condition; but if one does not ride almost daily, preparation must certainly be made for any particularly long ride or tour. The preparation need not consist of any real "training," except for racing; but should be in the nature of more regular, harder, and longer rides than usual. If a century run is contemplated, several weeks of ten miles daily, at a good pace, should be had, and then, once a week perhaps, a ride of thirty, forty, or fifty miles. As preparation for a tour, fifteen or twenty miles should be ridden daily, if possible, for a couple of weeks, though five or ten miles a day at a *rapid gait* will answer very well as a preliminary. For either purpose, the rider will then be fit—that is, in suitable physical condition—and the long run, or the tour, will be a positive pleasure, with no danger of prostration from overexertion.

The enjoyableness of a tour depends in no small measure on being in sufficiently good riding form to make the work easy, and in laying plans so as not to be obliged to push along too fast. Wheelmen who ride irregularly, and make little or no preparation, should be very cautious when starting to tour awheel; they are apt to plan too long a trip, with too great a daily distance, and find the

first few days very wearisome, even if they pull through. Forty to fifty miles a day is as much as one can do comfortably on give and take roads; if one, however, is really in good condition and practice, probably from five to fifteen miles more can be done without inconvenience. The location of good stopping points will go far to determine the exact distance for each day, as a route should always be carefully laid out in advance with a view to making halts at points where comfortable accommodations can be secured.

A majority of cyclists find touring most pleasant with a single companion, if one is fortunate enough to have a congenial friend who rides. The tourists, if but two, will be thrown into such close relationship that similarity of tastes is highly desirable. In a large party, one can be independent, and it is a matter of less consequence. When the party is limited to three or four it is possible to find accommodations at desired stopping points, without sending notice in advance, and feeling more or less bound to keep the engagement; but if there is a larger number it is sometimes necessary to take this precaution, and considerable work in the way of perfecting arrangements, and carrying them out on the trip, will devolve upon one of the number.

It is now, thanks to the League of American Wheelmen, a very easy thing to lay out a trip intelligently, and plan all details in advance, with full knowledge of distances between any given points, the character of the various stopping places and accommodations at them, and the nature and condition of the roads over which one must travel.

All this may be learned from the road books published by the larger State divisions of the League. These books are sold to non-League members at a comparatively high figure, but are sold to League members outside the State issuing them at a lower price, and supplied to State members at a merely nominal rate, sometimes less than cost and sometimes free of charge.

Some luggage has to be carried for any trip. If for only two or three days, it should be limited to a night shirt, comb, tooth brush, a few handkerchiefs, wash cloth, and light coat if one rides in a shirt or sweater. If for four or five days, a change of underwear and shirt should be added. These can be carried in a compactly rolled package on the handle bar, wrapped in a rubber cloth. Should the projected trip be a long one, or the tourist desire to make a more elaborate toilet at his principal stopping places, he can, of course, forward such extra baggage as he needs by express, and in this way secure some additional comforts; but he should, even in this case, carry with him on the wheel the few articles first enumerated.

It is every year becoming the practice of increasing numbers to spend their vacations on their wheels. When this is done the change is so complete, the recreation so perfect, that the greatest benefits are obtained. A few suggestions on the subject, from the pen of Mr. J. Cleveland Cady, illustrate clearly its advantages and pleasures:

"Anyone who wishes to get the most out of a vacation, both in healthful invigoration and pleasure, will find a wheeling tour superior to any

other means. Nothing so completely takes the mind from business; the wheel demands and will have all the attention that is not absorbed with the scenery, or circumstances of the trip; business and the ordinary cares of life are quite forgotten. The lungs receive a thorough revivifying, and the circulation starts into healthful activity; sleep becomes sound, appetite voracious, and digestion perfect. Certainly this is an ideal condition for an overworked brainworker or a man enslaved in the routine of business.

"A professional man in this city had been kept at his confining calling all the summer, and as fall came on his family saw that he was in very bad condition, and had reason to fear he would go into a sudden decline. A friend persuaded him to take a vacation with him of two weeks, on a wheel. He did so, and came back in fine condition, which he retained through the winter—sleeplessness, nervous prostration, and depression all gone, and a hearty vigor instead.

"A few points for those wishing to get the most out of a vacation on a wheel may not be amiss. For moderate luggage, a traveling bag or box can now be obtained fitting into the frame of the cycle and not the least in the way, which will carry a surprising amount of attire, and conveniences of various sorts—a change of underclothing, collars, cuffs, and white shirt, patent leather pumps, toilet articles, and even a light serge suit. By this means a tourist at night, or on Sunday, can have the luxury of a fresh outfit. This is a rather more independent plan than sending baggage ahead by

the train or express, although some will prefer the latter. For short trips, or trips of a few days, or even two weeks, it has worked admirably. The box in the frame looks better and is less in the way than any attachment to, or near the handle-bar, and its weight is much better placed.

"The box should be so made that its cover can be entirely removed for compact packing. If made of leather-colored water-proof, pasteboard, or leather itself, it presents a tasteful appearance, which cannot be said of any other form of conveying cycling luggage. In its stores should be included needles, thread, safety-pins, sticking plaster, and a bottle of Pond's Extract and glycerine, half and half of each, a most useful and soothing remedy for bruises or cuts.

"Make the journey with a view to *having a good time in every respect;* not for making or breaking records, or performing surprising feats. Plan the trip, if possible, through an interesting region, and one that has fairly good roads. By means of 'road books' and local maps, lay out the route carefully, even though circumstances may at times divert you from it. Take pains to arrange it that you secure first-class accommodations at night: excellent beds, and a supper and breakfast that leave nothing to be desired.

"It is worth while to go out of one's way to do this, and decidedly to strain a point for the best. The midday meal can be taken at any farmhouse or village inn, if only the other two meals and the bed are something to look forward to. Seek out interesting places and scenery (turning aside for

the purpose, if necessary), and stop and enjoy them. Do not hesitate to make frequent stops for a drink from the mountain spring; for a view of the pretty wooded dell; to see some quaint old building; or to chat with some interesting rustic. An observant person will thus have many items of fresh and piquant interest in his note-book by night.

"Finally, a good-natured friendliness toward the people one meets will elicit much kindness from them and a great deal of interest about the region in which you are traveling. It is surprising how generous a return a little effort in this direction will secure, until it seems as if everyone were trying to tender an ovation and assist in making your trip a festal affair."

CHAPTER IV.

ACCIDENTS, AND THEIR PREVENTION.

AT the beginning of one's cycling experience, and especially during the first few weeks of riding on the road, some minor accidents will occasionally take place. These frequently cause little or no damage to either rider or machine, or perhaps nothing worse than a slight bruise, or a bent pedal; but sometimes the damage is slightly greater to the rider, the machine, or perhaps to both. It is therefore well to describe the more common forms of accidents, and offer a few suggestions as to how to avoid them.

When bicycles first came into use, the handlebars used on them were exceedingly narrow, being about twelve or fourteen inches wide. By degrees they were made wider, and about 1890 reached a maximum width of twenty-seven to thirty inches. Since then, they have been reduced in width, so that now from seventeen to twenty inches is regarded as the correct thing. With the reduction in width, the great sweeping curves have been reduced, and now a bar about the width of the body, and curved back some six inches, directly in front of the rider's arms is believed to be the most comfortable, and to give the best control of the

steering. In some cases, however, and especially on old or cheap machines, wide bars are found, and it frequently happens in such cases that the handles strike against the knees in making a quick or sharp turn, and may possibly cause a fall. This must be carefully watched if wide sweeping bars are used. It is much better, however, to have the bars reduced to twenty inches (or even one or two less), so that the rider's hands will be in front of him, instead of spread out at the sides. Bars can be bent at competent repair shops, to any shape, without injury to the nickel, at a reasonable price.

When roads are wet or muddy there is apt to be a slight tendency for wheels to slip sideways, if ridden carelessly. To obviate this, one should ride as steadily and straight as possible, avoiding sudden turns and sloping surfaces, and in crossing car tracks should go over them nearly at right angles. A brake will always slip more or less on a wet tire; so an easy gait should be taken in order that the machine may be principally controlled by means of the pedals. The rear wheel may slip sideways several inches without throwing the rider, if he rides steadily; but an equal slip of the front wheel is likely to cause a fall. This is because when the rear wheel slips the steering is not seriously affected, but if the front wheel slips it is exceedingly hard to recover one's equilibrium, for the equilibrium is maintained solely by means of the front wheel.

Occasionally a fall will occur if either foot slips off the pedal, as the body may be suddenly thrown

too far to one side, and the balance destroyed. But if one is riding at a moderate gait, the pedal can usually be recovered, and the equilibrium maintained without a fall. Sometimes, however, a rider is unfortunate enough to slip his pedal while crossing some bad spot, and have his wheel strike an obstacle before recovering it, and in this case a fall is more likely to occur. In order to reduce to a minimum the chance of slipping a pedal, ankle action should be cultivated persistently, and one should carry his weight well on the pedals, rather than on the saddle. Should a pedal still be slipped, the rider should instantly steady himself by means of the other pedal and the handles, and pedal firmly with the other foot until the lost pedal is recovered.

In case of striking a small obstacle, nothing more than a slight bump, or a trifling deflection from a straight course is usually experienced. The instant, however, anything unusual in the road surface is encountered—be it a stone, block of wood, rough spot, depression, or the like, the handles should be grasped more firmly, and all the rider's weight carried on the pedals. This eases both rider and wheel immensely, and often prevents a fall. It should be practiced assiduously until it is done automatically on meeting an unobserved rough spot as, for instance, at night when the road cannot be clearly discerned. Should an obstacle large enough to stop the wheel be encountered, the rider will be somewhat thrown forward. He should hold the handles firmly and press backward, and as he comes down should reach out with the

foot on the side toward which he falls, and he will land safely.

On a strictly first-class machine it is a very rare thing for any nut or screw to loosen, if properly set, but it is not safe to presume on that fact; because many so-called high-grade machines are not all they are represented to be, and because few persons see to it that all parts are properly attended to. In order to prevent accidents, all nuts and bolts should be felt of occasionally with a wrench, and the brake tested to make sure that it will act properly. Riders should remember that no brake that is applied to the tire will hold firmly when the tire is wet, and govern themselves accordingly.

If one rides without a brake, it is more than ever necessary to cultivate back pedaling, in order to insure control of the wheel, both for slowing up and stopping quickly, and for holding it safely down steep grades. In order to learn to use the foot as a brake, turn the toe in, and rest the forward part of it on the tire, with the outer side of the sole resting against the fork side. Try it at first on a slight grade, and increase the pressure on the tire very gradually, at the same time taking care that the toe is not drawn in under the fork crown. Also have care that in running over a rough spot, or "thank-you, ma'am," your foot is not jolted off the tire, and then thrown back with such force as to cause too sudden a stop, or is not suddenly drawn in too far beneath the crown. The foot is the most effective of all brakes, but it must be used *very* cautiously, and carefully

and the head kept cool, especially down rough hills.

Coasting is very exhilarating, but it leads to its full share of accidents, and often serious ones. On a straight hill, not too steep, with good surface, and free from vehicles it is safe enough usually, if one keeps cool; but if the bottom cannot be seen, if it is very steep, if it is rough, rutty, or sandy, or if there are vehicles on it, it is always dangerous and should be avoided, or indulged in only with the brake partly on and the machine under full control. In any event, all cross-roads should be very carefully watched, as vehicles turning in from them suddenly are very dangerous. Also, whether pedaling or coasting, vehicles closely in front of a rider must be carefully watched, as they are very liable to slow up suddenly, or turn in front of you into some yard or side street. It is the best way not to pass a vehicle just at any cross-street, until you see that it is not about to turn into it.

Riders ought to observe all the rules of the road, and not court disaster or engender ill feeling by disregarding them. It is very common for a number of wheelmen to divide, both on meeting and passing vehicles, and in so doing increase the chance of frightening horses, and make collisions far more probable. In the case of collision between two bicycles, it should be remembered that the aggressor will receive the less damage if the machines are of equal strength, so that if a collision is actually unavoidable, it is worth while to become the aggressor if possible, or at least to endeavor to give as much shock as you receive.

It requires some months of diversified riding to accustom one to the various conditions that are to be met, as well as to learn all the peculiarities of a mount and become thoroughly at home on it. Probably this last point has as much as anything else to do with immunity from trouble and accident. It is of the first importance that the machine should be a good fit, and every part properly adjusted. This being done, careful and continuous practice should be taken until the machine seems to become a living part of the rider. No new feat should be undertaken simply because others seem to accomplish it easily, for though all feats on the bicycle are easy and graceful when mastered, they usually require cautious, slow and persistent practice at the outset. It is a good rule to make haste very slowly in learning any new feature of bicycling, and not to take any foolish chances, nor indulge in any bravado or recklessness.

On the other hand, don't work yourself up into a nervous state over imaginary difficulties and dangers, and don't cross any bridge until you come to it. Moreover, don't think that you *can't* do a thing, simply because you are nervous about it, and feel averse to making the first attempt. Everything on a bicycle is easier than it looks. Don't desert your wheel because you seem to be in a tight place. Be alert, keep your head cool, and in nearly every case your wheel will stick to you and pull you through.

CHAPTER V.

CORRECT PEDALING.

IN bicycle riding the opinion prevails that one has but to push upon the pedals in order to propel the machine, and this is true enough so far as merely imparting motion to it is concerned. But as riding in its fullest sense means something more than mere ability to put the machine in motion; so pedaling in its fullest sense means a great deal more than merely giving the pedals alternate pushes as they come around. It will be readily admitted that the pressure should be steady, uniform, and strong, but beyond this few ever go.

The art of pedaling once received considerable attention, but since the advent of safety bicycles it has been well-nigh forgotten. When the old high wheels were the only kind known, all who rode them soon learned to realize that their comfort and speed, as well as safety, depended largely upon the way they held their pedals and used their ankles; for uneven pedaling, or slipping a pedal, often caused serious accidents. But the safety changed all that. Headers became practically impossible, and other falls infrequent and harmless. Old riders grew careless in their ankle action, and the

hosts of new riders that came in with the advent of the safety were not instructed in the art. Nevertheless, it is of the highest importance, as will be shown.

The pedal is the point at which the energy of the rider is transmitted to the cycle, and so forms the chief connecting link between cyclist and wheel. The degree of perfection with which the connection is made goes far to determine the whole character of one's riding. The connection between foot and pedal becomes effectual in the action of pedaling, and the art of correct or *scientific pedaling* is itself essentially the art of cycle riding.

The importance of a perfect connection between foot and pedal appears in every function exercised by the pedals in the propulsion of the wheel. On the simple revolution of the pedals depends the propulsion of the machine; on the rapidity with which they are revolved depends the rate of speed; on evenness of pressure depends steadiness in riding and ability to steer without use of hands; on continuance of pressure by means of good ankle action throughout the larger part of each revolution depends economy of energy, uniformity of motion, and hill climbing power; on skill in back pedaling depends the degree of control that can be acquired independent of the brake; on proper application of power at bad places depends facility in taking them easily, steadily, and quickly; on carrying sufficient weight on the pedals depends firmness in proper position; all these combined go to make up the art of pedaling, which, when acquired, makes all riding easy and pleasant.

Correct form in pedaling depends upon the foot being able to secure a firm hold of the pedal at the lowest point of its revolution, and on an ankle action which gives the foot a grip of the pedal throughout the *larger part* of each revolution. From this it follows that the necessary conditions of scientific pedaling are correct reach and perfect ankle action ; and the advantages gained from it are a firm connection between rider and machine, which make them seem as one ; a complete control of the wheel, insuring comfort and safety ; economy in the expenditure of power, by securing maximum results from minimum exertion ; the practical removal of that old-time bugbear " dead centers " ; and good form in riding.

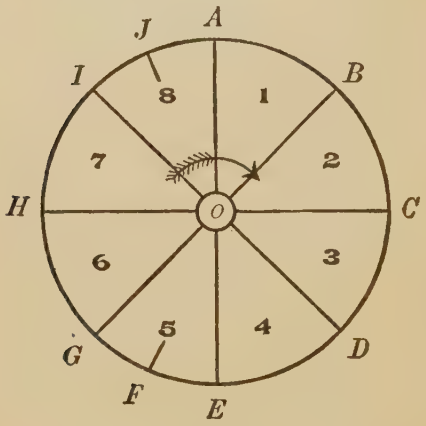
It is not necessary to consider again the importance of securing a proper leg reach, nor to dwell upon the advantages of doing so. It is only necessary now to call attention to the fact that the vital importance of a sufficiently short reach will again appear in the consideration of ankle action, in which art it is an essential feature.

With the saddle set at proper height, ankle action is to be learned for the twofold purpose of mastering the machine, and of enabling the rider to apply power to each pedal throughout the *larger part* of its revolution. To simplify the explanation, the following illustration should be studied.

In the action of pedaling, each foot describes a complete circle. In the following illustration let the radii, *OA*, *OB*, *OC*, etc, represent a crank at different points of its revolution ; and suppose the rider to be seated nearly vertically above his work,

so that his leg moves up and down in nearly the vertical line *AOE*.

Now, the simplest form of pedaling—that which everyone naturally adopts—is a straight downward thrust, in the direction of the line *AOE*; that is to say, the natural tendency in pedaling is for the rider to exert pressure only in a purely vertical direction.



Thus, suppose one crank to be at the highest point *A*, and the other crank at the lowest point *E*, and the pressure on them to be wholly vertical; in this position no amount of exertion will move the wheel forward, the power being, as was said, exerted wholly vertically, and the cranks remain on the dead center. When a machine, however, once gets the impetus of a start, the momentum imparted

by every stroke upon the pedals is sufficient to carry the crank beyond the dead center.

Riding upon the level thus becomes quite simple, even though the rider's thrust upon his pedals is directly vertical; but let him ride up a grade, and a new effect is at once experienced. As the incline becomes steeper, each thrust upon the pedals sends the machine forward a shorter distance, and presently it becomes very difficult to press the cranks over the dead center. The machine moves very slowly as the dead center is being passed, and when passed the rider gives a hard push with all his power to gain fresh headway with which to overcome its recurrence. This is exceedingly hard work, and the rider will be compelled to dismount after an attempt or two of this sort, as equilibrium cannot long be maintained under such conditions. It is thus obvious that a purely vertical pedal action leaves one to a considerable degree at the mercy of the dead center (which consequently has become a bugbear to many), and also puts one at a great disadvantage in hill climbing.

Consult the illustration again, and it will appear that as soon as the cranks pass the dead center (points *A* and *E*), the upper one begins to descend very slightly, and, continuing its descent, passes in nearly a vertical line in describing the curve *BCD*, while from *D* to *E* the curve again rapidly approaches the horizontal, Now, notice the different portions of the curve *ABCDE*. Immediately on passing *A*, a purely vertical pressure on the pedal will have but a trifling effect. The effect will increase as the first segment is passed, and it

will reach its maximum at the point *C* at the end of the second segment. From there on to D, the effective power decreases slowly, and from *D* to *E* more rapidly, so that on reaching *E* the dead center is again reached. With vertical pressure, much power is wasted while the crank is passing through segments 1 and 4, the power not then being applied at *right angles to the end of the crank;* but, in passing through segments 2 and 3 the pressure applied is most effective, as it is applied through these two segments *nearly at right angles*, though only at the point *C* is it absolutely at right angles to the end of the crank.

Moreover, in pedaling vertically the pressure is not usually applied to the pedal until it has passed quite a distance beyond the point *A*, and it also decreases very rapidly after passing the point *D*. Under such circumstances, power is utilized in only about three segments, say from midway between *A* and *B* to nearly midway between *D* and *E*. The pedal action, instead of being even, steady, and harmonious, consists of a series of vertical thrusts, or jerky strokes; momentum is necessarily relied on to pass the dead center, and to carry the machine over bad spots; much power is wasted; hill climbing is difficult and wearisome, and complete control of the wheel is impossible.

These considerations show plainly the great disadvantages under which a rider would labor if he could exert pressure on his pedals only in a strictly vertical direction. As he would apply power to the pedal in but little more than three segments, shown in our illustration, each pedal would be

doing work only through about one hundred and sixty (160) degrees, or the two pedals through three hundred and twenty (320) degrees, leaving forty (40) degrees, or one-ninth of a complete revolution, in which no work is done. If so unfavorable a result were *necessary*, the cycle would be shorn of half its possibilities; but fortunately it is not. The case, however, just supposed, if it appears to any to be something of an extreme one, is not nearly so exceptional as one might imagine. The number of riders who pedal vertically is very large, and many who pose as good riders have miserable ankle action.

Between a straight vertical action and a perfect ankle action very many degrees of proficiency are possible, and examples of all of them may be seen practically illustrated on the road wherever wheelmen ride.

Next to the simple vertical thrust comes the action in which the toe is slightly depressed below the level of the heel as the crank passes from *D* to *E*. Or, perhaps, instead of this, the rider drops his heel a very little after the crank reaches *A*, and approaches *B*, and so exerts a slight pressure in the early part of the revolution, but this is very rare. He may even, if practical and experienced, combine these two points, and drop his heel a trifle at the beginning of each stroke, and depress his toe slightly toward its close. If he does both of these things, he may possibly exert *some* pressure through one hundred and eighty (180) degrees, or one-half of the circle (*A* to *E*), with each pedal. In this case there is a perceptible gain in every

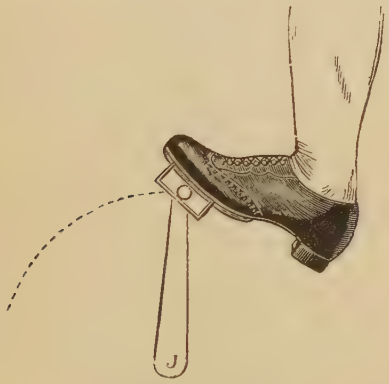
revolution over the case of only vertical pressure. This degree of proficiency is far more than most wheelmen exhibit, not because there is any serious difficulty in the way of acquiring much greater proficiency, but largely because they have never learned of the possibilities and advantages of anything else.

It has now been shown that poor pedaling permits the efficient application of power through considerably less than one-half the revolution of each pedal, and that fair pedaling insures its application through possibly one-half. It follows that good pedaling will enable the rider to apply his power through one-half, or even a little more, of each revolution, and perfect pedaling to do so to even a still greater extent.

The method of applying power properly has already been hinted at. As the pedal, in ascending, passes the point *I* (see illustration) the heel is to be depressed as far as possible below the pedal, of course keeping the toe firmly in its position. This will enable the rider to apply his force early in the revolution, and also more nearly at right angles to the end of the crank, which is the direction in which it is most effective. If the heel is well depressed as soon as possible after passing the point *I*, it will be practicable to apply pressure to the pedal in a forward direction before the point A is reached. At first, the amount of pressure that can be applied back of the highest point of the stroke (behind the point *A*) will be very small, and the distance back of that point at which it can be applied will be insignificant; but, with careful and

persistent practice, the ankle will adapt itself to the motion, and the application of effective force to the pedal can be begun even as far back as the point *J*, which is twenty degrees back of the vertical.

The illustration of the foot on pedal at beginning of stroke shows very plainly how the heel is to be

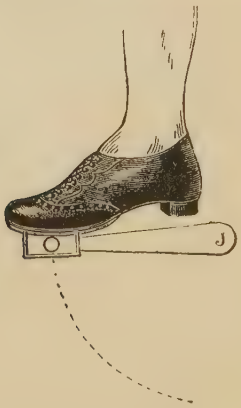


BEGINNING OF STROKE.

depressed as the crank comes over the highest point in the revolution, and gives a clear idea how the pedal can be actually pressed forward at a time when few riders begin to think of exerting any pressure at all.

Bearing in mind that force is most effective when applied at right angles to the end of the crank, it is very important in pedaling to always apply the power as nearly as possible at this angle, and then to apply it through as great a portion of each revolution as possible. With vertical pressure, power is

applied at right angles to the end of the crank only at the point *C*. If, however, the heel is dropped early in the stroke (say about the point *I*) some power can be applied as the point *J* is passed, and from *A* down to *E* it can be applied very nearly at



MIDDLE OF STROKE.

right angles. To do this properly, the *heel* must be slowly raised as the point *A* is passed and the crank begins its descent toward *B*, and it must continue to rise uniformly as the crank descends to *C*, so that when that point is reached the heel will be nearly on the level of the toe.

When the heel and toe are level at the middle of the stroke (point *C*), the power is being applied exactly at right angles to the end of the crank, and the work is easiest and most effective.

Continuing thence to *D* the toe is to be depressed slightly below the level of the heel in order to con-

tinue the pressure at right angles, and from *D* to *E* to be depressed still more, and from *E* backward to be depressed as much as the ankle permits, in order to maintain a pressure as far back as possible. After considerable practice, it will be found practicable to maintain some pressure past the point *E*,

BOTTOM OF STROKE.

even as far as *F*, which is twenty degrees back of the vertical.

In reaching the bottom, or lowest point, of the stroke the heel will be much higher than the toe, and the toe will be pressing back vigorously as shown in the cut. As the pedal passes on and begins to rise from *F* past *G* and *H* the heel again drops to the level of the toe so that, as *I* is passed, it is ready to drop and again repeat its duties.

It will be noticed at once that this process keeps heel and toe constantly changing their relative positions and allows them to be on a level, or at what may be called their most natural position,

only on passing the points *C* and *H*. The duty of keeping them up to this work falls upon the ankle, so that on the perfection of ankle action depends effectiveness in pedaling. It is somewhat tiresome at first to keep the ankle at such continuous work; but it soon becomes almost as natural as steering, though some attention should be constantly given to it, as continual improvement in it is practicable. The results attainable are worth much more than the trouble of learning—if trouble it is to seek to acquire skill in what one undertakes, and especially in a pastime in which pleasure and profit are directly dependent upon skill.

By acquiring good ankle motion, instead of exerting pressure with each foot through only one hundred and fifty to one hundred and eighty degrees, it becomes possible to apply power through two hundred to two hundred and twenty degrees, and it also applies the power more effectively throughout the whole distance. Before passing the dead center line *AOE*, the dropped heel allows power to be applied to the upper crank, in pushing it forward past that line, while the depressed toe of the other foot makes it possible to apply power to the lower crank in pushing it backward; consequently, the dead center is practically annihilated. Scott, in his valuable work, tells how he measured the power he applied at the dead center point, and found thirty pounds applied on each pedal. Thus, at the point where a rider with poor ankle action is exerting no effective pressure at all, the one with good action is doing important and effective work with both ankles.

The rubbers fitted to some pedals give a good hold for the foot, especially if rubber-soled shoes are worn, and with them satisfactory results may be obtained, if the directions here given regarding reach and ankle action are followed.

Pedals having only steel side plates, however, are more generally used, as being lighter than rubber, and are very excellent; but when these are used the rider should have shoes for cycling only, and have cut in the soles two rows of narrow slots to exactly fit over the steel points on the pedal sides. He can find the exact points at which to cut the slots by getting on his machine and pressing hard with each foot so that a row of marks is made on the soles, and then small, narrow holes should be cut by a sharp shoemaker's knife at these places. This is better and neater than putting on blocks or cleats. Further assistance can be had by means of toe clips, which fit over the front of the toe and prevent slipping, and enable some riders to continue their pressure through a greater number of degrees than they otherwise could.

It is better, however, to assiduously cultivate a good ankle action than to rely upon any unnecessary aids. They are not always at hand, and their absence easily comes to cause discomfort. On the other hand, skill once acquired is always available, and in the long run is much more desirable. For road riding, rubber or rat-trap pedals are all that can be desired, but for use on the race track toe clips are necessary, as they are a distinct aid when moving at a very high rate of speed.

CHAPTER VI.

SPEED AND GEARING.

HEN safety bicycles were first introduced it was a source of constant surprise to most observers that they would travel as rapidly as the machines with much larger wheels then in use. It is obvious that a large wheel goes farther at each revolution than a small one, and it was not easy to see how this advantage in favor of the larger wheel was to be overcome. Of course, a small wheel might possibly be pedaled twice as fast as a large wheel, double its size, and in that way be made to travel as fast as the large wheel; but this method of increasing speed required far too rapid leg action for comfort. It was necessary to be able to pedal at about the same rate as on a high wheel, or even somewhat less rapidly, and at the same time make the wheels of the safety revolve at least twice as fast as the pedals. If this were accomplished, the pedals and rider's feet would revolve at a comfortable rate of speed, while the wheels of the safety were revolving as much more rapidly as might be required or desired.

The means adopted to accomplish this object

consist of two small wheels with toothed edges (called sprocket-wheels) connected by a chain, and this arrangement of sprocket-wheels and chain constitutes the "gearing" of the machine. One sprocket-wheel is attached to the crank axle, between the cranks, and the other is attached to the hub of the rear wheel of the machine.

It is obvious that the front sprocket (the one between the cranks) must revolve at exactly the same rate as the pedals and cranks to which it is attached. Suppose that the rear sprocket-wheel (the one on the hub of rear wheel) is of precisely the same size as the front one. The two are connected by the chain. Consequently, they revolve at the same rate, and the rear wheel rotates at the same rate as the pedals. When this is true—one revolution of pedals causing exactly one revolution of rear wheel—the machine is *geared level.*

But one revolution of a twenty-eight-inch wheel would propel the machine but a little over seven feet, and would require about seven hundred and twenty revolutions per mile, which would be far too many to make with comfort. This difficulty, however, can be overcome, and the number of pedal revolutions per mile greatly reduced, simply by making the two sprocket-wheels of different sizes. If the front sprocket is just twice as large as the rear one, every revolution of the front sprocket turns the rear sprocket and rear wheel around twice, and the rear wheel makes two revolutions for every single revolution of the pedals. It thus follows that while the rear wheel continues to make seven hundred and twenty

revolutions per mile, the pedals make but three hundred and sixty revolutions. This making the two sprocket-wheels of different sizes, so that the rear wheel revolves more rapidly than the pedals constitutes *gearing up*.

Of course a twenty-eight-inch bicycle wheel must always make its seven hundred and twenty revolutions per mile, quite irrespective of the gearing of the machine; but, as explained just above, the size of the front sprocket may be so increased that the number of revolutions per mile made by the feet are very much less than the number made by the rear wheel. If the number be reduced one-half, then the feet make but three hundred and sixty revolutions per mile, and this is just the number that are made by a fifty-six-inch wheel; consequently, a wheel so geared would be geared up to fifty-six inches.

The number of teeth on the sprocket-wheels bear a direct relation to the size of the driving-wheel, and each individual tooth bears its own relation to the size of the driver. One full revolution of the rear sprocket causes a full revolution of the driving-wheel. If the rear sprocket has eight teeth, a full turn of the eight causes a full turn of the driver, and a turn of but one of them turns the driver but one-eighth of its way around. Consequently in this case each tooth represents an eighth of the size of the wheel, and one-eighth of twenty-eight is three and a half inches. In the same manner, if there are seven teeth on the driver, each tooth represents one-seventh of it, or four inches in gearing.

In order to find the gear of a machine, first count the number of teeth on the rear sprocket, and then find the value of a single tooth by dividing the number of teeth into the diameter of the wheel. Suppose each tooth has a value of four. Count the number of teeth on the front sprocket, and multiply them by four. If there are sixteen teeth in front the gear is sixty-four.

It thus appears that with, say, seven teeth on the rear sprocket (each tooth then having a value of four inches), and seven teeth in front, the machine would be geared level—7 front teeth × 4-inch value of tooth = 28-inch gear of wheel. For every tooth added to the front sprocket, four inches would be added to the gearing, and fourteen teeth in front would make the gear fifty-six, or sixteen teeth would make it sixty-four.

If D= Diameter of driving-wheel in inches;
T= Number of teeth on driving-wheel axle;
A= Number of teeth on crank axle;
G= Gearing.
Then

$$\frac{D}{T} \times A = G.$$

Example: A machine has a twenty-eight-inch driver, seven teeth on driving axle, and sixteen teeth on crank axle. We then have $\frac{28}{7} \times 16 = 64$, which is its gearing.

As any number of combinations of teeth may be had on the two sprockets, any desired gear can be provided for.

If it is now clear what gearing is, and how it is obtained, the remaining question is what effects it produces.

In many respects gearing is like the steps taken in walking. On a low gear (up to 56) it is necessary to pedal quite rapidly in order to acquire a pleasurable speed. This has the same effect as trying to take *very short steps* and yet walk quite fast. It is wearisome, because short steps taken rapidly are really harder work than slightly longer ones taken more slowly. Even when walking slowly, a very short step becomes quite tiresome, and the only condition in which it really offers much advantage is in going up hill; and even then, if one is accustomed to a hilly country, it is not necessary to materially alter one's ordinary gait.

It is much the same with a wheel. Low gears force the rider to keep his feet constantly in rapid motion, if he is going to maintain a fair riding gait, while higher gears reduce proportionately the number of revolutions that the feet need to make. The first safety bicycles were very heavy (fifty to sixty pounds), and a low gear on them was necessary on account of their weight. Then, too, makers had had no experience in gearing, and adopted gears that about corresponded with the sizes of the larger high wheels—fifty-four for full roadster safeties, fifty-six for light roadsters, and sixty for racers. But even these heavy safeties were an advance over the former high wheels, and with about the same gears they seemed comfortable and fast.

If a person does much walking, he soon finds that a moderately long step and a steady gait enable him to cover the largest amount of ground with the least fatigue. On the safety, as now lightened and improved, the same is true as regards gearing. A medium gear (58 to 63) reduces considerably the number of pedal revolutions to be made, and though each push requires slightly more power, this is actually more than offset in use by the increased comfort secured.

No two persons are exactly alike, however, and it is highly important for each person to learn for himself, as far as may be, just the point where the comfort of the slower leg motion seems to be balanced by the added exertion called for by the higher gear. Such a point actually exists for everyone. In order to find it, it must be clearly understood that the slow pedal motion of high gears is in itself very desirable, for it means comfortable action and good speed; also, that slower action means increase of necessary pressure and greater muscular exertion at every revolution, which means tiring more rapidly. The question resolves itself into this form—is it easier for me to pedal fairly fast, and not require very much exertion at each revolution of the pedals, or to pedal a little more slowly and do harder work each time?

In seeking for an answer to this problem there are several points to be considered. First, the lighter the machine, the higher the gear that can be used. Second, the smoother and more level the roads, the higher may be the gear. Third, the shorter one's experience, the lower should be the

gear. Fourth, the less one is accustomed to active outdoor exercise, the lower must be the gear. Fifth, the rougher or more hilly the roads, the lower the gear. Sixth, the light, nervous, active man can pedal rapidly and push a moderate gear, while a heavy, strong, or stolid person can better pedal more slowly, and so use a higher gear.

Experience has shown just about how much range is necessary in gears in order to supply each person with what is best adapted to his needs. On light roadsters, between twenty-two and twenty-five pounds weight, the gears suitable for most men are 60, 63, and 64, and for women 56, 58, and 60. On semi-racers and racers higher gears may be used, but there is a limit to the use of high gears which is not commonly understood or appreciated.

It is evident that any man, no matter how strong, athletic, or experienced he may be, must find somewhere a gear at which the advantages and disadvantages offset each other, and which therefore is the highest gear he can ride to advantage. Experience shows that the average rider on a light wheel can get most satisfaction with about a sixty gear in a rough or hilly district; with a sixty-three or sixty-four where the roads are good or level, and a sixty-eight for racing.

It is commonly supposed that a rider can improve his pace simply by adopting a high gear; and, consequently, high gears are popular. This impression nearly always proves erroneous, and pace is not improved to anything like the extent

anticipated. A rider's pace depends on his gear to only a *limited extent*. Races are seldom won because gears are high. Success depends primarily on *rapid pedaling*, and a man must learn to pedal rapidly if he expects to ride fast or to win races. It is by no means enough to be able to hold a good hard pace from start to near the finish. Races are generally won in the last few yards, and to be successful then it is absolutely necessary to cultivate a good sprint and acquire the art of rapid pedaling.

It is generally thought that high gears make a great saving in the number of pedal revolutions per mile, but this is an error, as will appear by consulting the following table. From it will be seen that in the lower gears (50 to 57) a difference of one inch in gear makes a difference of but seven revolutions per mile; in the medium gears (58 to 63) a difference of one inch in gear makes a difference of but six revolutions per mile; and in the high gears (above 63) a difference of one inch in gear makes a difference of under five revolutions per mile. It thus follows that as the high gears are entered, their advantages are relatively decreased, because the saving in revolutions is decreasing, while the exertion required to make each revolution is increasing. Every rider should try to learn just what gear meets his own needs best, irrespective of what gears any others may use, and if he is in doubt should take the lower gear, remembering that pedaling and not gearing will always win.

TABLE OF FEET PER REVOLUTION AND REVOLUTIONS PER MILE.

GEAR.	FEET PER REVOLUTION.	REVOLUTIONS PER MILE.
50 inch	13.09	403.36
51 "	13.35	395.50
52 "	13.61	387.86
53 "	13.87	380.54
54 "	14.14	373.48
55 "	14.40	366.66
56 "	14.66	360.16
57 "	14.92	353.83
58 "	15.18	347.73
59 "	15.44	541.83
60 "	15.70	336.30
61 "	15.97	330.62
62 "	16.23	325.32
63 "	16.49	320.19
64 "	16.75	315.22
65 "	17.01	310.40
66 "	17.28	305.73
67 "	17.54	301.08
68 "	17.80	296.63
69 "	18.06	292.35
70 "	18.32	288.04
71 "	18.59	284.02
72 "	18.85	280.25
73 "	19.11	276.29
74 "	19.37	272.59
75 "	19.63	269.00
76 "	19.89	265.46
77 "	20.16	261.96
78 "	20.42	258.57
79 "	20.68	255.41
80 "	20.94	252.14

The following table will show at a glance what is the gear of any bicycle. All that it is necessary to do is to count the number of teeth on the two sprocket-wheels of a machine, and find the corresponding numbers in the left-hand columns; then

follow out the line to the column over which stands the size of your *driving*-wheel, and there will be found the correct gear.

TABLE OF GEARS.

Teeth on Chain-wheels.		The Gear when the Diameter of Driving-wheel is			
Crank.	Hub.	24	26	28	30
16	6	64	69 1/3	74 2/3	80
16	7	54 6/7	59 3/7	64	68 4/7
16	8	48	52	56	60
16	9	42 2/3	46 2/3	49 7/9	53 1/3
16	10	38 2/5	41 3/5	44 4/5	48
17	6	68	73 2/3	79 1/3	85
17	7	58 2/7	63 1/7	68	72 6/7
17	8	51	55 1/4	59 1/2	63 3/4
17	9	45 1/3	49 1/3	52 8/9	56 2/3
17	10	40 4/5	44 1/5	47 3/5	51
18	6	72	78	84	90
18	7	61 5/7	66 6/7	72	77 1/7
18	8	54	58 1/2	63	67 1/2
18	9	48	52	56	60
18	10	43 1/5	46 4/5	50 2/5	54
19	6	76	82 1/3	88 2/3	95
19	7	65 1/7	70 4/7	76	81 3/7
19	8	57	61 3/4	66 1/2	71 1/4
19	9	50 2/3	54 8/9	59 1/9	63 1/3
19	10	45 3/5	49 2/5	53 1/5	57

CHAPTER VII.

TRAINING.

RAINING for any contest consists in preliminary preparation for it. This preparation may be a brief one if time is short and the person already in good condition; but if the contest is of a kind new to the intending contestant, the preparation ought to be of some considerable duration. The poorer the physical condition of the person, the longer and more gradual ought the training to be. It must also be gentle and careful at the start, and refrain from subjecting the person to any hard work for which he is not prepared. The mild and scientific measures now adopted by competent trainers are a marked contrast to the harsh measures and severe treatment formerly considered necessary. This change has come about through better and more varied classes of men participating in athletic sports—men of good habits, and men incapable of bearing harsh treatment—and also through the scientific study of the principles and objects of training.

Though training in its full sense requires a certain amount of time and attention, as well as the observance of some definite rules, the *preliminary preparation* which must precede it is a simple affair, and in fact is just what everyone desiring to have a sound body, capable of performing all its

functions properly, ought to undertake. It involves little more than regular hours ; sufficient sleep to thoroughly recuperate mind and body ; good, wholesome food ; great moderation in the use of stimulants ; and regular, daily, brisk, outdoor exercise. Such system as this is so extremely modest that it is hardly worth the dignity of a name, and probably would not receive one were not the conditions of modern life so complex and harassing that simple and natural ways of living are almost unknown. Health is pretty generally subordinated to "success" in life, and the physical condition is ignored until some difficulty has intrenched itself in the system. Adoption of the rational methods just mentioned as preliminary to real training would remedy this, and would put the system into condition to enter vigorously and successfully into one's daily occupation. The following detailed directions in regard to objects and methods of training are taken from the work on that subject by Cortis, who was a physician as well as a cyclist, and also a very successful racing man. What he says, therefore, is entitled to double weight :

"The object of training is twofold: (1) To produce perfect health, the *Mens sana in corpore sano ;* and (2) To develop special powers in individual organs ; and it is arrived at in two corresponding stages.

"In treating of the first of these stages it would not appear necessary to dilate at any great length, and yet it is the more important of the two, inasmuch as without a firm basis it is impossible to raise a sound superstructure. Moreover, its ob-

ject is common to everyone, and continues throughout life, from its earliest to its latest period. Its rules are simple, and may be summed up in the words 'Live well but temperately, and avoid sloth and self-indulgence.'

"The young man should rise betimes, but not too early, say seven in summer and a little later in winter, according to the time required to get easily to his place of business. On getting out of bed his first proceeding should be to take his cold bath, and a quarter of an hour's exercise with the dumb-bells or Indian clubs. In summer the exercise should be taken first, so that the bath may remove its effects from the skin; while in winter it should follow the bath so as to insure thorough reaction. Delicate youths—especially those with any tendency to consumption—may have to omit the bath in the depth of a cold winter, but as a rule, so long as reaction takes place, indicated by a warm, glowing sensation after the bath, it has done good. On the other hand, if the feeling of cold or shivering occur, there is danger of catching cold, and it should not be persisted in. Brisk rubbing dry with a *rough* towel follows, as a matter of course. The club or bell exercise expands the chest, and strengthens and develops the lungs, which latter phrase the reader will please to remember signifies the means by which a 'good wind' is produced. We much prefer this system to taking any very strong exercise before breakfast, which in most cases takes a lot out of a man, and produces a feeling of fatigue lasting through the greater part of the day. Should our neophyte, however, be so

fortunate as to live near the sea, or a river, or swimming baths, he can, during a large portion of the year, with advantage, take his morning exercise and bath together, a good swim replacing the clubs or bells. We can imagine nothing better with which to commence the day than a swim of ten to fifteen minutes' duration, though at the same time we would most earnestly caution our readers that this length of time should never be exceeded by anyone training for racing. This, with a brisk walk of twenty minutes, will be quite sufficient; but even this amount of exercise should not be taken absolutely fasting; a crust of bread, or still better a plate of porridge made of rough oatmeal, with a cup of milk, should invariably be taken before leaving the house. Breakfast is to be taken about eight o'clock, and should be of a substantial character, a chop or steak, or a piece of ham or bacon, with bread and a little butter, being *eaten*—not *bolted*, but thoroughly masticated. A lightly boiled egg may be taken occasionally, but not too often, as it undoubtedly tends, when too constantly repeated, to produce that form of indigestion termed 'biliousness.' Potted meats and similar made and spiced dishes should not be taken —not only are they indigestible, but the best part of their most nutrient principles has been removed in their preparation. Coffee with milk should be drank, as tea taken at this time of the day, and followed immediately by exercise, is apt to produce flatulence, sometimes to a painful extent. After breakfast we imagine that our friend will have to proceed to business. If this (business) does not

of itself yield him sufficient walking exercise during the day, he will of course walk to and from his office instead of riding, proceeding at first in a sufficiently leisurely manner, as too *active* exercise immediately after food is hurtful. A substantial plain dinner should be taken in the middle of the day, about one o'clock. Beef and mutton will, of course, be the daily staple articles, combined with a proper amount of vegetables and bread, and pastry or a small quantity of rice or other plain pudding. The dietary at this time may present considerable variety, although it must be confined to easily digested, nutritious articles, which are sufficiently numerous. Among meats we have game and poultry of all kinds, with fish. Some of these may be usefully intermingled with the beef or mutton, say twice or thrice a week. Veal, and especially pork, must be most rigidly avoided, their extreme indigestibility having been proved by actual experiment. Oysters are the only kind of shell fish that can be permitted during strict training. Of vegetables, potatoes of course will be the chief; next comes the *flowery* part of freshly cut cauliflower, and occasionally young carrots or asparagus when in season. Turnips should be avoided, and also cabbage, without it be young and freshly cut. With a little plain pudding or fruit tart, dinner will now be completed. Water must as yet be the only beverage; but a few years later a single glass of bitter beer may be allowed. The meats must *not* be overcooked, but the vegetables should be thoroughly well done. It may here be pointed out that all the articles we have just mentioned have

their several uses in the human economy. It is not sufficient merely to supply the body with the muscle-making meats, but a proportion of starchy matter, chiefly bread and potato, is requisite to furnish fat,—a certain amount of which is necessary,—while articles containing carbon and hydrogen, such as the vegetables generally, and the fat of meats, are required for consumption in the liver to enable that organ to assist the action of the lungs in maintaining the heat of the body. Tea, with bread and butter, and a little fish if desired, will be taken as soon as business is over, which we presume will be by six o'clock.

"After tea comes the principal active exercise of the day, then a supper of cold meat and bread, and to bed soon after ten. This routine will be varied by additional active exercise on Saturday afternoons and other holidays.

"In going through this *régime*, we have, as occasion occurred, indicated various matters to be avoided. There are, however, two of great importance not yet mentioned. These are the use of stimulants and tobacco smoking. We have simply to say of both that they are to be utterly avoided. 'Touch not, taste not, handle not.' We object to the smallest quantity of either.

"The object at which we have hitherto been aiming has been to bring the body with all its organs to a state of vigorous, robust health, and fit it for the endurance of active exercise and fatigue. Any man who, by the regimen we have recommended, or by means analogous thereto, has arrived at this point, is now in a position to commence the final

stage of training, or what many will consider as training proper, provided he has reached a suitable age and possesses no constitutional impediment. It would be folly for anyone with diseased heart or lungs to attempt active training; the affected organ would break down, and the result would probably be very disastrous. Anyone having the slightest doubt as to the perfect soundness of either of these organs should have their condition carefully examined by a medical man, and be guided by his opinion. Again, no one should attempt active training till he has well completed his nineteenth year; although the heart and lungs may be fairly healthy, the strain upon them may easily at an earlier age be more than they can bear.

"Commencing as before with the general regimen and diet, these will continue much the same as in the first stage. The hours for rising, going to bed, and meals, will not require to be altered, nor have we anything to change in what was said about the morning bath and exercise. Even in the dietary, the only meal requiring any alteration is the dinner, and that very slight; poultry or fish had perhaps better be intermingled with beef or mutton on rarer occasions. His drink at meal times will still be water, but the additional exercise and consequent perspiration will probably produce thirst; sometimes indeed this is caused to an extent which is painful, especially as old-fashioned trainers sternly refuse to allow the smallest quantity of any liquid to be taken to quench it. This utter restriction is unnatural and absurd, although, on the other hand, it is certainly

advisable to refrain from taking more liquid than is absolutely necessary. The best drink under these circumstances is cold tea, without milk or sugar. About this, there cannot be the slightest doubt; every description of fluid has been tried, and nothing stands the test equal to this. Its action can be much assisted, and the quantity to be swallowed diminished, by merely rinsing the mouth and bathing the face and hands with cold water.

"His exercise must now be taken as much as possible on his bicycle, and this machine should be of the same make and resemble as closely as possible in height and build the one on which he intends racing; especially is it important *to have the throw of the crank exactly the same in both roadster and racer*, as the feet are thereby accustomed to work in the same circle, follow the treadle more accurately, and are much less likely to slip off the pedal when going at full speed.

"Having procured his machines, he should commence riding not later than the middle of March, and with tolerable weather he will be in good condition for racing by May. He should take a short, sharp run each evening of the week, with a longer ride on Saturday afternoons, increasing these as his condition improves, so as to arrive home moderately tired, but by no means exhausted. He will then enjoy his supper, and drop into a sound and refreshing sleep as soon as his head touches the pillow, whereas exhaustion will deprive him of both appetite and sleep. During these runs he should occasionally indulge in sharp bursts on the level to improve his speed and up hills to improve

his wind. In riding hills, however, he should always take care not to commence his sprint until he is certain that he can keep it up quite to the top, and a little over. As a matter of course, he will at first find himself blown comparatively soon, for he must remember that the first stage of training has given him endurance rather than speed, and has only moderately exercised his lungs. In increasing this exercise he must still adhere to moderation in the beginning, and not run himself out of wind, or till a fit of coughing is produced. We have often seen cases where this latter has been a most distressing symptom in the earlier stages of training when entered on too energetically, and have ourselves experienced it. He will soon find himself able to take quicker and longer spurts, and that the feeling of being blown, when it comes on, more quickly subsides. After about six weeks of this road work he will be ready to complete his training by a little practice on the track. Here he must not be disappointed if, during the first two or three spins, he finds that he can neither make the pace so fast, nor keep it up so long as he expected; but every day he will improve in both respects.

"Beginning with short spurts of a quarter of a mile or less, and gradually increasing, he will in a fortnight or three weeks find himself able to do a mile in fairly good time; these runs should be taken in the company of other, and if possible, better men. By this time he will probably wish to try his powers in a race, and as one mile is the most usual distance selected, we will take that as

a standard from which to base our remarks, and he will find the following hints useful in assisting him to make the best of his capabilities. Let us for convenience' sake suppose that he can do a mile in 3 mins. 8 secs., which is an average of 47 secs. for each quarter. Most inexperienced novices would probably start off at topmost speed, and doing the first quarter in—say 45 secs., the next in 46 secs., and the third in 48 secs., come home at a very slow pace in 49 secs. for the last quarter, feeling completely run out, and possibly disheartened in consequence; especially if he had a considerable lead in the early part of the race and had flattered himself with an almost certain win, only to be beaten in the home run and not able at the finish to make the semblance of a struggle for victory. Instead of this our friend should endeavor to regulate his speed, so that each quarter-mile should be a shade quicker than the one preceding it, when he will be able to keep a reserve of strength sufficient to enable him to make a gallant fight with, and possibly beat off any short-start men who may have caught him up. Of course, this is not a hard and fast rule to be blindly followed in every race, but it will be found a good plan to practice in training and to commence with; and he may reasonably anticipate that every week will see him diminishing the time for each of the three earlier quarters. When he can, still adhering to this principle, accomplish the first quarter-mile in 46 secs. the second and third each in 45, and the final in 44 or less, we may leave him to his own devices for making further improvement at this

distance. For longer distances he should act on the same principle, that is to say, commence with and keep up a steady regular pace, just within his powers, and endeavor to do each of the earlier miles as nearly as possible in the same time, making the last mile the fastest one in the race. In these longer races he will find the advantage of sticking just behind a man going about the same pace as himself. It is a singular fact, very well recognized but not easily accounted for, that this makes going infinitely easier, and saves a man immensely for the finish, while, on the contrary, having no one to take him makes the work much harder. He must take care that his front wheel is *outside* the hind wheel of the man in front, so that if the latter suddenly slows he may have room to turn out and avoid a collision. Many accidents have happened through neglecting this precaution. During the greater part of his first season it would be better to confine his attention to races not exceeding three or five miles in length. Frequent short races with constant, well-regulated practice will develop the powers to the utmost, give experience, and improve the judgment of pace, etc., without running the risk of overtaxing the strength and producing staleness.

"After every practice the rubbing dry with a rough towel is most essential, and between the heats of a race sufficient warm clothing must be worn to prevent a chill. It is good policy to do no active work on the day before the race, to avoid all possibility of arriving at the post in anything like a jaded condition. A few words as to the

taking of food on the day of the race may be useful. The usual breakfast will of course be taken, but the mid-day meal should be timed to take place as near as may be two or three hours before the race. This will secure a double advantage: the stomach takes about two hours to perform its part in digesting a tolerably full meal, at the end of which time it has passed it along to the adjoining portion of the digestive apparatus. During these two hours the body is not in a fit condition for active exercise, but at this stage the nutrient principles of the digested food begin to be poured into the blood, to be by it conveyed to the various parts of the body to replace the waste of tissues constantly going on, and of course most actively during severe exercise. It will be readily understood that if the last food has been taken so long before the race that its digestion is completed, nothing will be left to supply this waste, and the consequence will be exhaustion and loss of power. A fairly good meal should therefore be taken about two hours (not less) before commencing to race. These remarks apply equally to practice. During an ordinary afternoon's racing of three or four heats, additional food will not be requisite; or, if the contrary be experienced, it must only be taken in small quantities, as a meat sandwich before the last heat. Should the racing, however, be prolonged, something more may be desirable, and the best form for this will be a fresh egg beaten up with a tablespoonful of brandy and a little water; but this must only be taken either immediately before the last heat, if there are several, or toward

the extreme finish of a race if it be a long one. The reason for this is that food taken in this form begins to be absorbed into the system immediately on entering the stomach, and at once produces its effect on the body. The immediate effect of the brandy is to revive and stimulate the exhausted powers, but this *reviving* effect only continues for a very short time, certainly less than half an hour, after which reaction takes place with a positive increase of exhaustion, corresponding to the previous temporary revival. It too often happens that an attempt is made to relieve this exhaustion by again applying to the stimulant; but it will be found that at each repetition the good effect rapidly diminishes, while the resulting exhaustion as rapidly increases. The reason, therefore, for taking only a *single* dose of the stimulant, and that within half an hour of the termination of the day's work, becomes self-evident. After a long race (25 or 50 miles), the rub-down should be more thoroughly performed, and a good but not too hearty meal should be taken, consisting of a good-sized mutton chop or corresponding piece of rump steak with bread, and half a pint of bitter beer, and then to bed. The result will probably be nine or ten hours' refreshing sleep, which, with the following morning's bath, will remove all trace of extra exertion.

"Certain ideas more or less vague have been engendered in the public mind as to the dangers incurred by athletes from their exercises. We have sometimes seen in the journals accounts which would lead the reader to think that nearly

everyone practicing these exercises must eventually be brought to an early grave by disease, especially of the heart. It will be seen that we have spoken of them as resulting, not from training, but from overexertion. As a matter of fact they usually result from *want of training*—at any rate of *judicious* training—from rushing too quickly into violent exercise without proper preparation. A man may be fit enough for all ordinary purposes of calm and quiet life—his daily walk to the city, or an occasional run to catch a train—but yet the organs we have just described may be wholly unable to resist any extra strain. The fibers of the heart and vessels are comparatively soft, flabby, and easily dilated or ruptured; the chest has never been properly expanded, and therefore cannot accommodate itself to the increased call upon the lungs, and allow them room for extra play. Now will be understood the importance of the directions in our earlier pages that ample time should be given to the process of training, and that it should proceed slowly, especially in its early stages. It is evident that change from soft and more or less fatty tissue into dense, firm, muscular fiber cannot take place in a day, nor yet can the chest be expanded in a similar space of time; but give nature the opportunity and assistance we have indicated from the commencement, and it will be found that her powers are vast, and that she will seldom fail to so accommodate her organs to their extra work, as not only to deprive athletic exercises of their dangers, but make them actually subservient to increased health and longevity."

CHAPTER VIII.

CYCLING COSTUME.

FOR masculine riders it is universally agreed that a negligée costume of outing shirt or sweater, loose fitting coat, fairly full knee breeches, long stockings, and low shoes is the only comfortable thing. The head gear may be according to taste. The old styles of tight fitting, braided garments have disappeared, and club uniforms are almost a thing of the past. Taste, neatness, and individuality, within the bounds of reason and suitability, are now sought after, and with most pleasing results. The colors selected are often the best, grays and browns in mixed goods predominating, and being by all odds the most suitable ones for the purpose in hand.

For comfort, and for protection against cold, a light-weight sweater in summer and a heavy one in winter is far ahead of any other form of garment for steady riding. The writer was never very enthusiastic over their appearance, and for years he tested every possible substitute, but finally satisfied himself from actual trial that the sweater is the safest and most healthful article to wear. A light or medium weight undershirt should be worn beneath it.

The coat should be a fairly loose sack, not too short, with rolling collar. The general tendency is to make them too short, and this should be guarded against. The knee breeches should be moderately full, and of ordinary size at the waist. A strap or belt may be worn, but should never be pulled very tight, or suspenders may be used if preferred. Below the knee the breeches may be fastened by a buckle, elastic, or strings; this being entirely a matter of taste.

Stockings of dark gray or some plaid look best in the long run; black ones are more dressy, but show dust badly. Some persons can make them stay in place by folding over the tops, but generally a support is required, and supporters that run over the shoulders are the best. Any low shoes that are not too tight fitting will answer, but should have fairly heavy soles, and when rat-trap pedals are used, they should have indentations made to fit the pedal points. These are the main features that cannot well be departed from, but modifications may be made to meet individual tastes.

In dress for ladies, however, there is practically no limit to the styles that may be adopted, now that "rational" costumes are meeting with favor, and so large a number of designs are being brought forth and tested.

It is entirely possible to make the ordinary skirt in such form that it will be free from all the objections commonly urged against it, with the single exception of the resistance it presents to the wind. This is accomplished by making it of ordinary walking length, not too full, and of fairly heavy

material, even for summer use. The difficulties and dangers that have beset women's skirts have always been due to one or more of the following errors in construction, viz.: too great length ; too

SKIRT OF WALKING LENGTH.

much fullness, or too light material. The writer's wife has established these facts pretty thoroughly in an experience of ten years, with all kinds of cycles. By conforming to the suggestions above made she has never met with an accident, while

those who neglect them are frequently subjected to more or less serious difficulties.

Next to the skirt of walking length is the short skirt that comes down to the tops of the boots.

SHORT SKIRT.

The material, as before, should be moderately heavy, and not too full. Long leggings or gaiters, preferably to match the skirt, should be worn. For riders who prefer to retain the ordinary skirts, this arrangement is hard to surpass. The advan-

tage of this form, however, can be combined with that of ordinary walking length by making the skirt of walking length, and providing it with four straps, arranged to look like ornaments, and hang-

SKIRT OVER KNICKERBOCKERS.

ing at equal intervals from the waist. A short distance below each strap is a button, to which it can be attached, and so shorten the dress about six inches.

The skirt is also frequently worn with knicker-

bockers beneath it, which are made of the same material as the costume itself and must be carefully fitted and well cut. They should be full over the knee and gathered just below it with an elastic band. They are fastened at either side of the waist, and often have several gores over the hips. The black satin ones are fastened with a strap and buckle, and look very much like the satin and velvet knee breeches that used to be in fashion years ago for men's wear.

Long leggings or gaiters are always worn with knickerbockers in bicycling. These leggings are very difficult to get well fitting. As yet, no one, bootmaker or tailor, has attained the acme of perfection in them. Many of these are made of the same cloth as the knickerbockers and are buttoned to the band below the knee. When so well clothed there is less danger of catching cold and less danger from falling than when many skirts are worn. Low shoes under the leggings are most comfortable, but there must be no undue pressure about the ankles, for if one would ride properly it is there the greatest strain must come. Some women think they ride better without corsets, and certainly tight lacing is out of the question. But corsets quite short and not laced too tight do not interfere in the least with riding very comfortably, and are a decided improvement to almost every figure. The women who can go without corsets under any circumstances are women who from their youth up have never worn them, and to start off on a long bicycle trip without them would be quite as injurious as to wear even too tight ones. Riding

corsets are quite as good for bicycling as for horse-back, and can be bought at a comparatively trifling expense.

DIVIDED SKIRT.

A simple modification of the regular skirt is the divided skirt, which is practically an ordinary skirt

cut part way up the center, front and back, and then so fastened that it hangs in the form and shape of a regular skirt, but in reality so divides as to facilitate the movement of the rider's limbs.

The regular woman's skirt can be made safe

BLOOMERS.

and convenient for bicycle use in any of the ways just described, but there are two advantages that can be obtained by doing away with the skirt altogether. They are the reduction of wind resistance, and the saving of weight in the bicycle, owing to

the practicability of using a diamond frame machine. The gain in the first of these cases cannot, of course, be appreciated until one has actually removed the skirt and ridden without it; in the

KNICKERBOCKERS.

second case, the advantage is less than formerly, because of the marked improvements lately made in ladies' drop frame machines, and the reduction in their weights, though they are still, of necessity, heavier than diamond frame machines.

When the skirts are discarded entirely, the garment which replaces them is made like exceedingly

KNICKERBOCKERS.

full and loose knickerbockers, held in place just below the knee, and falling gracefully a short dis-

tance beyond over leggings or gaiters of the same material. They give a most excellent effect, when

PARISIENNE.

properly fitted and tastefully made, and do not interfere in the least with feminine dignity and modesty. The advantages of bloomers are con-

siderable: they offer less resistance than skirts to the wind; there is more freedom in the use of the limbs; there is nothing to catch in the machine in mounting, dismounting, or in riding; chain and wheel guards can be removed from the machine altogether, or a diamond frame wheel can be used if desired, or a drop frame can have its upper tube placed high enough to brace it more thoroughly.

These styles of dress are neat, practical, tasteful, and can be modified or changed to meet almost any requirements. Some prefer to adopt knickerbockers almost exactly like those worn by men, to be worn either with a waist or a sack coat. In France, and especially in Paris, the ladies wear knickerbockers, either with or without leggings, and very short skirts over them not reaching as far as the knee. Such dress must, of course, be exceedingly comfortable.

The waists worn are many and various, and can be suited to the season and personal taste. Sweaters are exceedingly comfortable, and are the neatest and most suitable thing for long rides and touring, and with short jackets to wear over them are quite the thing. Heavy gloves are necessary, as light ones are of no use.

CHAPTER IX.

PRACTICAL POINTS.

Abuse and Misuse.—*See* USE AND ABUSE OF CYCLES.

Accidents.—*See Chapter on* ACCIDENTS, AND THEIR PREVENTION.

Adjustability.—The earlier types of cycles generally possessed few and imperfect means of adjustment of the various parts; but, as their lines and workmanship improved, satisfactory means of making adjustments became common. First-class bearings are now perfectly adjustable for wear. Good saddles can be adjusted for position, in order to secure the best angle. Chains can be adjusted in a moment to take up slack; the position of footrests can be changed; the head can be very delicately set, and handle-bars changed both in height and position.

Advantages of Cycling.—These are, briefly, the enjoyment of perfect digestion and good health; a fascinating and exhilarating pastime; an exercise which tones up the system and tends to remove craving for stimulants; and a practical, convenient, and easy mode of locomotion. *See Chapter on* CYCLING FOR HEALTH.

Ankle Action.—*See Chapter on* CORRECT PEDALING.

Anti-Vibration Cycles.—*See* VIBRATION.

Back Pedaling.—This is one of the elementary accomplishments of a good rider, as explained in the chapter on Learning. It should be acquired in an early stage of one's experience; not by waiting for emergencies to call for its exercise, but by deliberate practice until it is mastered. It can only become thoroughly effective when the reach is sufficiently short; but, this being secured, the secret of power is in griping each pedal just as it comes around to its very lowest point, and in applying the weight and power at that point.

Ball Bearings.—These reducers of friction are applied to all the revolving parts of high-grade cycles. They usually consist of a single row of small steel balls running on hardened surfaces, in delicately adjusted bearing boxes.

Ball Heads.—Ball-bearing heads were but little used on the old, high bicycles, but have been improved and are now universally used in safety bicycles. A properly adjusted ball head makes the steering more pleasant and even, and requires very little care and attention.

Bath or Rub-down.—For a person in ordinary health, exercise is nearly always most beneficial when carried on until a moderate perspiration is induced; and if one is in vigorous health, or accus-

tomed to exercise, a more profuse perspiration is desirable. In order to be comfortable when perspiring freely, it is necessary to be dressed suitably for the work in hand, and to make a complete change of clothing when it is over. When the change is made, the body should be cleansed of perspiration and of the impurities which have been brought out of the pores. If the exercise has been only of ordinary duration or severity, a thorough rub-down is all that is required. The body should be rubbed briskly with a rough towel, not only till thoroughly dry, but until a glow has been imparted to it, especially to the chest and arms. Then, on dressing leisurely, new exhilaration and increased tone will be felt throughout the system. If the ride has been unusually severe, a full bath, using soap, may be taken with advantage, and the body rubbed as before till a glow is induced. A sponge bath is of little, if any, more value than a good rub-down. Of course it is supposed that a regular, thorough bath, with good soap, is taken weekly in winter and semi-weekly in summer.

Bearings.—The novice usually puts too much or too little oil in his bearings. A little at a time, tolerably often, is a pretty safe rule. Bearings should be watched and not allowed to get loose. When any very perceptible play appears in them, they should be adjusted; but this must be done very cautiously, care being taken not to do anything more than take up the play. If a machine is used for several years, it is well to have a competent cycle repairer look it over, possibly once a

season, in order that the bearings and other parts may be properly cleaned, adjusted, and cared for.

Bells and Whistles.—In many places the law compels a cyclist to carry a bell or whistle, and to give warning on approaching a team from the rear. It is sometimes easier, better, and more effective to use one than to use the voice, and a bell or whistle should always be carried for use in case of need.

Books and Records.—Various cycling "logs," have been put on the market, and meet the demands of those who want especially prepared record books. Many cyclists, however, make no pretense of keeping a record, while some go by simple guess-work, or, as they are more apt to call it, "careful estimates," and others simply glance at the reading of their cyclometer from time to time. For those, however, who want to keep daily records, and do not care for special "logs," a small, cheap diary costing anywhere from fifteen to fifty cents will answer every purpose, and will also contain a calendar, the dates of moonlight nights, and other handy facts. It is often pleasant to look back over the record and recall the pleasant experiences which come to mind on consulting the brief notes of a ride.

Brakes.—Good brake power was formerly considered essential to every cycle, and was usually well provided for, but within the past year or two the makers have practically given up fitting and

supplying brakes, unless specially ordered. This is due to two causes—the demand for extremely light wheels, which necessitates the removal of every ounce that can be removed, and the fact that nearly all brakes when applied suddenly, or strongly, or on a steep hill, are pretty sure to injure pneumatic tires. Foot brakes, to attach to the front forks, and act upon the front tire, weigh but five or six ounces, but are liable to injure the tire. Then, too, on a very steep or rough hill, it is desirable to steady the wheel by back pedaling, and this can only be accomplished when a hand brake is used and both feet are on the pedals. A most excellent foot brake, and one little likely to injure the tire, clamps to the lower part of the frame, is easily operated by the foot, and is very effective. It acts on the rear wheel. Some riders use a foot as a brake, by pressing the sole of the shoe on the front tire immediately behind the front forks. This must be done carefully, and the toe not allowed to be drawn in under the fork crown. It is very effective. Whatever form of brake is used, *apply it gradually*, and keep the machine under control from the start.

Brake-holder.—It is far harder on the hand than one who has not tried it would suppose to hold a brake tight while descending a long or steep hill, and the fingers and muscles will sometimes be sore and stiff when the brake is released. Attempts to remedy this have sometimes been made, but machines have never been sent out with any brake-holder attachment. One can

hardly be regarded as a *necessity* unless a great deal of hill riding is done. If, however, one is desired, it can be improvised by making an oval ring of stout wire, or metal, to hang on the handle-bar, which can be pulled along over the brake level on descending a hill, thus setting the brake as tightly as is wise or necessary.

Breathing while Riding.—Some few persons have naturally what is called "good wind," but the majority very easily get "out of breath." In all kinds of exercises, the management of the breath is an important feature of success, and even of comfort. It is necessary to learn to breathe more deeply and rapidly than one does under ordinary circumstances. To many, this is difficult at first, because they are so entirely unaccustomed to it, and because they incline to breathe through the mouth, thus parching the throat and causing much discomfort. The acquirement of good wind, however, can be somewhat facilitated by making a practice of breathing exclusively through the nose, and by taking deep breaths under ordinary circumstances. When the first fast spin on a cycle is taken, the impulse to open the mouth is very strong; but it should be strenuously resisted, and the pace reduced to a speed at which it is possible to keep the lips closed. Careful practice will make it much easier to keep them closed, and will improve the wind materially.

Bundle Carriers.—*See* LUGGAGE CARRIERS.

Care of Cycles.—It is an easy matter to take proper care of a machine, and requires but little time if a few minutes are given after a ride. The dust should first be brushed away from around the bearings, and then the other parts wiped off. The chain must be brushed clean, and cared for as described just below. If the machine is wet or muddy, it should be stood in a dry, *warm* place, and then it can be cleaned at leisure. A full nickel machine, if treated in this way, will not need much more care than an enameled one. The head, bearings, pedals, chain, and nuts should be felt of occasionally to see if any part is loose, and if one is, it should have prompt attention. It is well worth while to keep a machine carefully wiped off, as dust and mud, if allowed to accumulate, are pretty sure to work into some place where they do harm.

Celluloid Goods.—American riders usually dress for comfort on the wheel, and sometimes go to the extreme of being actually untidy in appearance. Linen is generally, and wisely, eschewed; but flannel can be made to appear as neat while being far more suitable. When the addition of a white collar and cuffs is desirable for purposes of extra dress, the best article to use is probably celluloid. The collar, cuffs, and shirt fronts made of it will not wilt down with perspiration; they can be washed clean in a moment, and they last a long time.

Chains on Cycles.—It is a fact generally known to wheelmen that there are certain running parts

in a bicycle, called bearings, which require occasional lubrication in order that the machine may run well. These parts are supposed to be mainly the front and rear axle and crank axle; but how to lubricate them to advantage, and how often it should be done, is usually considered in a rather hazy way, and is apt to be overdone or underdone. Some riders recognize that pedals also require lubrication, and others discover that it is important for the head as well. Here are six parts of a machine in which there are evidently bearing parts to be kept running smoothly, and on these six parts there are about fifteen points at which the oil may be advantageously applied. This is simple and clear, but there is a seventh part not quite so simple.

A bicycle chain is composed of about fifty links which work on little pins to the number of about one hundred. In order that a chain may run smoothly over the two sprocket-wheels, it is necessary that the links should work freely on the pins at each joint; for if they do not do so, the tighter links will creak as they pass around the sprockets, and the chain will tighten at times, snap, and run stiffly.

Each one of these pins on which the links work constitutes a running part or bearing, and these bearings of the chain are not protected as are those in the machine. They are exposed to the dust, and they accummulate dirt rapidly.

Bearing these facts in mind, it is clear that the chain of a bicycle is more directly responsible for the ease and comfort of the rider on one hand, or

trouble and annoyance on the other, than almost any other portion of the machine. To run well, the bearings of the chain must be clean and well lubricated, and the outer parts of the links clean, dry, and free from dust. These conditions can be maintained if a little trouble is taken, and the good results will make riding doubly pleasant.

Supposing a chain to be dirty and stiff, it should be removed from the wheel, dusted off, and then soaked for several hours in enough naphtha or kerosene to cover it. When removed from this bath, it should be wiped dry and all links worked backward and forward to make sure that they are perfectly pliable. It should then be given a similar bath in good lubricating oil, and each joint worked until it moves freely. Wipe it dry and replace on the wheel. Then take a stick of chain lubricant and rub the inner side of the chain with it, revolving the wheel slowly. Enough of the lubricant will adhere to the links to make them move smoothly and quietly. It gives the kind and quantity of lubrication that the outer part of the links requires; if it is clean and dry, it will not collect dust. On no account allow any moisture or grease on the outer portions of the links. Also remember that there is no one substance which is suitable for lubricating both the inside and outside of the links of a chain. Oil alone will answer for the inside, and a dry, clean, hard stick graphite for the outside. *The cardinal principle of chain lubrication is to keep the inside of the links clean and moist, and the outside clean and dry.*

When a chain has been thoroughly treated in

this way once, the operation does not need repetition for some time, unless the machine is used constantly on very dusty roads. For ordinary purposes it is sufficient to occasionally place a drop of oil near each end of all the pins of the links, where it will work in, and to dust the chain off every few days and rub it with the chain lubricant. A brush should always be at hand to be used for dusting the chain, and more attention should be given to it than to any other part of the machine.

Chamois Leathers.—Some cyclists use these leathers for cleaning purposes. Those who do can clean them when they become soiled by washing them; but if they rinse them out in clear water the leather will become hard and stiff. In order to have it remain soft, it is necessary to *leave the soap* in it.

Choosing a Mount.—In selecting a machine it is necessary to consult one's purse; to consider one's size and weight; to bear in mind the principal uses to which it will be put, as well as the character of the roads on which it will be run, and finally to suit one's tastes as far as possible.

As to cost, if one can afford to buy the highest grade it is perhaps just as well to do so at the outset, for there is no necessity for injuring a machine while learning to ride, but one sometimes gets more satisfaction out of a new mount the second season, as well as knowing better what is wanted. If one is limited in the amount to be spent, the question always arises whether it is better to buy a second-hand high-grade machine, or a new machine of

lower grade. Of course, tastes differ in such matters, and a good deal depends upon the condition of the second-hand wheel; but if it is not of too old a model, and is *really* in first-rate condition, it is more desirable than a new machine of inferior quality.

As to size and weight, a very heavy man should not choose a semi-racer, nor need a very light man push all the weight of a full roadster. For fast work, as road racing, a very light roadster is desirable; but for ordinary purposes, unless the roads are very good, a medium-weight is decidedly to be preferred. Very light weight machines are not suited to ordinary road use, unless one is able to get a new one about every season; a medium-weight machine will last longer, be more reliable, and run as easily under average all-round conditions. An over heavy machine is objectionable enough, but is apt to prove a more profitable investment than an over light one. Even for racing purposes, the importance of selecting a thoroughly strong and rigid machine cannot be too strongly urged.

Finally, it is well to satisfy one's fancy as to appearance and fittings on purchasing, if practicable, and not to be over-persuaded by anyone. To enjoy a wheel thoroughly, one should be able to take a pride in it, and he cannot do this if he dislikes his mount in any way.

Cleaning the Machine.—*See* CARE OF CYCLES.

Clubs.—Cycle clubs have everywhere followed the growth of wheeling and have accomplished

much good by means of organization. In cities, where they have been able to maintain good club houses and add social features, they have sometimes proved very successful and permanent; but when they have had no interest besides cycling, it has sometimes been found difficult to maintain an active organization for any length of time, for the interests which draw riders together when on the wheel seem to lose their efficacy when they are off it, especially after the first blush of enthusiasm has somewhat passed. Cycle clubs can be made enjoyable associations and are beneficial to the pastime when well managed, and it is well for all wheelmen to make some effort to maintain them.

Coasting.—Cycles, being vehicles and subject to the laws of the road, ought always to be kept well in hand, especially on steep hills. Through the courtesy of travelers on the road, objection is seldom made when a cycle travels at a higher speed than the law prescribes, or when one coasts moderately; but few persons can complacently see a cycle rush coasting down at fifteen to twenty miles an hour, and partly out of the rider's control. If, for no other reason than the possibility of frightening some horse, no one ought to coast on a hill on which there are any vehicles, unless he runs slowly, with his machine well in hand. If the road is *clear*, he can perhaps do as he chooses. Coasting is usually done at considerable speed, and with the wheel under less complete control than when riding on a level. Wheelmen ought to have some consideration for other users of the road in

this matter, and not coast freely unless the road is clear. They should also remember that should they cause an accident while coasting, they would probably be held responsible for it, as they could not be if they were pedaling, with their wheels under complete control. For suggestions as to how to begin to coast see the chapter on Learning.

Convertibility.—The term "convertible" was formerly much used in connection with tricycles built to carry two persons, when the pedals, chain, saddle, and connecting parts, used by one of the riders, could be readily removed by loosening two or three nuts, and the machine then ridden as a single. Such arrangement was sometimes advantageous, especially for the purse, and was for a time quite popular; but it had its disadvantages and, as a matter of fact, many persons who possessed convertible machines never thought of using them except in double form. To the majority, it was too disagreeable and annoying a task to remove and replace the detachable parts. Moreover, a machine built right for a single is neither properly balanced nor strong enough for a second seat and rider; while one built of proper strength and balance for two persons is too awkward and heavy for one person, when the extra seat is removed. Except upon highly utilitarian grounds, convertible machines cannot be considered equal, in complete adaptability to the needs of their users, to machines built to be ridden by a certain number only, and by no other number.

Crank-throw.—Some marked changes in public opinion regarding crank-throw have taken place. The character of racing machines at one time had so much weight with cyclists that roadsters were equipped very much like them, and among other features were fitted with very short cranks. Then, too, it was argued that the shorter the throw the less the distance the foot had to travel. A throw of less than five inches was not uncommon; and five, or five and a quarter, was considered quite long. After a time the mechanical advantage of a longer throw, even on racers, began to be recognized, and five and a half to six inch cranks were fitted.

A great impulse to the general adoption of longer cranks was given when the safety was introduced. Its appearance was hailed as the advent of a machine on which a combination of very high gear and very long cranks would produce wonderful results. But when it was found that long enough cranks could not be used to compensate for the phenomenal gears that were proposed, and supposed by some to be practicable, more reasonable gears were adopted, but the cranks were allowed to remain long. One result of this is that the average length of crank now is nearly an inch greater than formerly. The additional leverage gained by the use of long cranks is an important factor in getting a machine to run easily.

The actual length of crank-throw desirable is now pretty generally agreed on, six and one half inches being about right for light wheels, and a quarter inch shorter for track use, and a quarter

longer for road use if desired. For ladies' wheels with moderate gears, six to six and a quarter is about right, though a six and a half may be used with a high gear or by a tall rider.

Cyclists' Touring Club.—An English organization having over twenty thousand members, including small foreign branches. An initiation fee of one shilling, and annual dues of two shillings and sixpence, gives each member a monthly *Gazette*, reduced hotel rates almost everywhere in Great Britain, and introduction to a local consul at nearly every cycling town. The club has also done much to secure reduced railroad rates for cycles; to erect sign-boards; and to further road improvement.

Cycling for Women.—*See Chapter on* CYCLING FOR HEALTH, also APPENDIX.

Cyclometers.—A register for recording the distance traveled is an agreeable companion on a cycle, especially on new roads and on tours. There is considerable satisfaction in being able to tell how far one has gone, or what is the rate of speed, and its use makes it possible to keep an accurate record, which is not possible in any other way. The most satisfactory cyclometers are those which face upward on the left end of the front axle. They can easily be read while the wheel is in motion, which is a decided advantage. In purchasing a cyclometer, of course the first consideration is to procure a perfectly accurate one and, to secure this, one should be obtained having absolutely positive

action—that is, it must be so fitted and its parts so arranged that the revolution of the wheel imparts a corresponding action to its works, the motion thus being faster or slower as the revolution of the wheel is fast or slow, but always connected with the wheel's revolution, and corresponding exactly with it, and not depending upon an occasional motion to move its works.

Diet.—It is a happy fact that when one is riding regularly, though the rides be never so short, the stomach can digest practically everything, though the rider had before been a confirmed dyspeptic. This is considered more fully in the chapter on Cycling for Health. When one is doing only ordinary riding, the customary diet can be taken freely. If preparing for racing, some modifications should be made, for which see chapter on Training.

Distances.—For measuring distances *see* CYCLOMETERS, and for distances *see* RIDES, LENGTH OF.

Double Machines.—*See* SOCIABLES, TANDEMS, TRIPLETS, and QUADRUPLETS.

Dress for Cycling.—*See Chapter on* CYCLING COSTUME.

Drink while Riding.—A good many wheelmen are disposed to drink very frequently during rides in warm weather; but even water, which is the ordinary drink, can easily be used to excess in such cases; though, if one perspires freely, some liquid is particularly necessary. Exercise, during its continu-

ance, and after its cessation, causes a sensation of thirst. Frequent drinking, however, soon becomes a habit, but neither a satisfactory nor advantageous one. The constantly recurring sensation of desiring to drink makes one uncomfortable, while too frequent gratification of the desire is bad for the system. One can and should cultivate moderation in this respect. Water, of course, is most available and generally answers; but if one is much parched some simple thing like ginger ale, lime juice and soda, acid phosphate and soda, or milk, will better quench the thirst. For exhaustion, an egg beaten up in milk is more nourishing. Nothing alcoholic should ever be taken during a ride, and only in great moderation after it is over.

Enamel.—This form of japan, now generally used as the standard finish for first-class cycles, is deservedly popular. It is pleasant to the eye, is easily cleaned, and wears well if it has been properly put on. Its application requires heat and special appliances. For purposes of retouching, however, small bottles of excellent liquid enamel can be procured from any cycle dealer.

Fads.—The fads that have had their run among wheelmen at different times have touched nearly every feature of the sport, and have had something to do with many details of the construction of the machine, with the rider's position on it, and even with his dress itself. The two fads that have been prominent of late relate to the position of the saddle and the length of the handle-bars. Two or three

years since, every rider was busily engaged in moving back his saddle as far as he could possibly get it, until an absurd extreme was reached. Then the reaction set in, and in 1894 the other extreme was reached and saddles were in many cases set much too far forward. The best results are reached with the center of saddle about seven inches behind the crank hanger. So with handle-bars. In 1890 a not unusual width was twenty-eight inches. Since then it has been reduced, so that racing bars in 1894 were sometimes but fourteen inches wide. For racing, about sixeen inches is a good width, and for road riding from eighteen to twenty.

Food.—*See* DIET.

Gearing.—*See* TWO-SPEED GEARS, *also Chapter on* SPEED AND GEARING.

Handle-bars.—The most desirable lengths for handle-bars have been alluded to immediately above. In shape, they may be raised, level, or dropped, and any one of these forms may be perfectly plain, or may have either a single or double curve introduced. In any case, the ends should be made to come straight back, and be nearly parallel with the upper tube of the frame.

Handles.—The handles or grips on the ends of a handle-bar have, at different times, been made of many different substances, viz.: common woods, ebony, horn, ivory, vulcanite, rubber, cork and rubber, and cork, the last named being now almost

universally used, and being the lightest and pleasantest substance ever tried for the purpose.

Hill Climbing.—There are comparatively few good hill climbers. It is mainly due to the fact that hills are generally avoided or, when ridden, ridden at so slow a speed that no improvement is made in power to climb them, or to the use of too high a gear. On the old high wheels there was a distinct knack about hill climbing; but, on the safety, any man can learn to do well, if he will practice it and his machine is right. The last is a very important consideration, for bicycles vary very widely in this respect, and some makes are vastly inferior to others. Hill climbing is perhaps the severest test to which a light machine can be put, and a fine hill climber is certain to be a desirable machine, while a good coaster may or may not be, for sometimes very inferior machines coast fairly well. To climb hills well, the bearings must be true and perfect, and the frame so *perfectly rigid* that there is nowhere any yielding or loss of power. This is a rare combination, and marks the highest type of bicycle.

The first requisite toward acquiring this power is practice, and not only frequently at one hill, but at different hills, and at different rates of speed. At first, take an easy rise slowly, and with as even a gait as possible, endeavoring to reach the summit at the rate adopted at the start. If, when near the top, there is energy in reserve, a slight spurt to the brow of the hill can advantageously be made, and when the brow is reached

the speed should be gradually reduced and the wind regained while still pedaling. By degrees, the average speed in climbing should be quickened, but the start ought never to be at a faster gait than can be certainly maintained all the way to the top, it being much better for the rider, and easier in the end, to increase his speed as he nears the summit and end with a good spurt. It is a curious fact that a hard spurt on beginning to ascend a hill, followed by a moderate gait to the summit, will make one feel pumped out and exhausted, while a moderate gait three-quarters of the way up, followed by a hard spurt, will not be half so wearisome. The former method disgusts one with hill climbing, while the latter enables one to enjoy it.

It is a little hard at first to climb a hill at any speed, but one can improve with practice, and be also much improved on the level by it. By degrees stiffer grades can be attempted, but of course at a slower gait. Practice at a slow gait is also very valuable. In ascending and descending hills the question of leg reach is an exceedingly important one, because it is impossible to apply all one's power unless the ball of the foot firmly grips the pedal when it is at its lowest point; for when the toe barely reaches the pedal perfect ankle action is impossible, and without good ankle action a considerable portion of one's power is wasted. Practice in acquiring good ankle action is very important for hill climbing. Even pedaling should also be learned, and care taken not to apply the power by jerks at the beginning of each stroke—a

fault peculiarly common when the reach is too long—but rather to apply it evenly and firmly throughout the stroke. A position fairly over the work is the most advantageous, and with a proper reach and suitable handle-bars, the greatest power can be applied while sitting nearly erect.

Hiring Wheels.—*See* RENTING.

Home Trainers.—The term "home trainer" is sometimes applied to a stand on which a bicycle can be placed and held firmly in position, so that the rider can mount and practice pedaling while remaining stationary, the driving-wheel being allowed to revolve by the use of rollers. A home trainer proper, however, is practically a stationary bicycle of itself. A style much used has a metal base which carries an upright tube. In this tube slides a stout rod which carries the handle-bar, and a short backbone with a saddle. The saddle is adjustable in position, and the vertical rod to which the backbone is attached is adjustable for height. Near the base are two large revolving metal disks, to which the pedals are attached. By means of a simple brake the resistance can be indefinitely increased.

The use of the home trainer gives the best sort of indoor exercise, as it affords the same pedal motion which is characteristic of cycling, and which is so remarkably beneficial with it, and because, like cycling, it is equally suited to every degree and condition of strength, as it can be taken in every stage from the most charming moderation to the utmost severity; while every

form of exercise, other than cycling, requires from the start a certain pronounced effort or violence of exertion.

If the home trainer is used without the brake, rapidity of motion (see portion of first chapter regarding exercises of speed) can take the place of the resistance one meets on the road. For beneficial practice, one should pedal nearly twice as fast as he ordinarily rides, and of course he can pedal much faster for short distances. If one rides eight miles an hour he ought to pedal that distance in about half an hour on a home trainer. That amount done daily will keep one in excellent condition. For training purposes, a faster gait is required. The earlier home trainers were arranged to run equal to a fifty-four-inch gear, but later ones are sometimes geared as high as ninety, so it is impossible to make comparisons without knowing the exact gear in all cases.

Hotel Rates.—In most States the division officers appoint what is called a League Hotel in each town and city. Cyclists are recommended to patronize these houses which, in return, occasionally make some reduction from their regular rates. To secure this reduction, the current League membership ticket must be shown. As, in some cases, the reduced rate is (not wholly unnaturally perhaps) accompanied by somewhat poorer accommodations than usual, it is sometimes just as well not to show the League ticket until settling one's bill.

Interchangeability.—This is the system of making the parts of cycles by the same dies and cutters

and finished to the same gauges. When this is done, a broken part can be at once replaced, and will fit without alteration. American makers were the first to work upon this basis, and many foreign makers have by degrees adopted it. When parts of machines made in this way are kept in stock by dealers, it is comparatively easy and inexpensive to replace any part that is accidentally broken.

Lady Cyclists.—Now that the public are gradually realizing that one of their greatest needs is gentle and pleasurable open-air exercise, they are learning that women require it even more than men; and still farther, that cycling exactly meets all the requirements of the case for both sexes. If such a thing were possible, it is even better adapted to women and more beneficial to them than to men, for there is no other exercise whatever that is so gentle; so harmonious in its action; so pleasurably stimulating in its effects; so bracing in its character; so entirely free from violence or strain upon any part, when taken rationally; so accessible; so safe; so practical; so inexpensive; and in such good taste, as cycling. Every physician who has made himself familiar with the advantages of this particular form of exercise highly recommends it, and those who have learned practically what it does for the system are the most pronounced in favoring it for women. What it can do for them is testified to by those who never knew what good health was until they learned to cycle. *See Chapter on* CYCLING FOR HEALTH.

Lamps.—A lighted lamp should always be carried after dark, not only for the rider's guidance, but as a warning to those traveling on the road. In most towns of any size it is obligatory by law. To secure a good light, the lamp must be of fair size, its wick kept well trimmed, and the reflector clean. If these things are done, and proper oil is used, good results will be obtained. The most important feature of all is the oil, that specially prepared for bicycles being the only kind satisfactory to use.

Law of the Road.—*See* RIGHTS OF CYCLISTS.

League of American Wheelmen.—This is the national union of the cyclists of the United States. It was organized at Newport, R. I., on May 31, 1880, and numbers nearly thirty thousand members. Its objects, and the advantages of membership in it, are officially stated as follows:

"The League of American Wheelmen is an organization to promote the general interests of cycling; to ascertain, defend, and protect the rights of wheelmen; to facilitate touring, and to secure improvement in the condition of the public roads and highways.

"The L. A. W., as a national organization, includes all State Divisions, which bear relations to the national government very similar to those between State and Nation in the political world. The States not yet possessed of sufficient membership (twenty-five) to organize a separate division are governed directly from headquarters, as are the Territories, by the nation, politically considered.

"The claims advanced by the L. A. W. upon your patronage are of two kinds, abstract and concrete. In the abstract, it is your duty to yourself and to your fellows to so place yourself that mutual assistance may be obtained in the easiest manner, and that you may not reap the harvest of your comrades' disinterested labor without contributing to its support. Many have said: "I can avail myself of all the advantages accruing to cycling which have been obtained by the League, and need not pay my dollar to join the organization.' It is very true that a few privileges obtained by the League are granted to all wheelmen, irrespective of their membership in the League, but very many more are obtained only by showing the League membership ticket.

"In the concrete, there are offered to wheelmen advantages as follows:

"Every member receives a weekly newspaper (*The L. A. W. Bulletin*), which contains all the cycling news of the day, together with hints, suggestions, etc., to riders, descriptions of new machines, and correspondence from all parts of the country. This paper has always commanded a yearly subscription price of one dollar.

"Every member receives a membership ticket, which is a sufficient introduction to any local officer (consul) of the L. A. W., and voucher for the right to reduced rates in the many hotels with which the League has a contract.

"Every member acquires the right to legal protection by his State Division; or, especially if involving a national issue, by the main organiza-

tion. This right is by no means an empty one, for the history of the League attests the activity of interests averse to our recreation, and the danger of touring without this offered backing.

"Every member is given every facility for obtaining information concerning roads, hotels, and distances. A number of the Divisions, notably New York, Connecticut, Massachusetts, Ohio, Pennsylvania, Maryland, Rhode Island, New Jersey, California, Michigan, and Indiana, have issued road-books, which are given to members free of expense. Many of these could not be purchased for three dollars if the labor upon them had been paid a reasonable price.

"The League has made it possible for a cycler to ride the wheel on any street or highway in the United States.

"The League has upon its roll of membership more than twenty thousand wheelmen, and the fraternal benefit is extremely valuable. The National Meet and the various State Meets draw the members together in friendly intercourse, and are the source of much pleasure and enjoyment.

"The League has an arrangement with the leading hotel in every city and town in America, and members can procure liberal discounts by showing ticket of membership. More than the League dues may be saved in a single day.

"The League has adopted a uniform, made of the best selected stock. This is furnished to members at a very moderate price by the contractors.

"Among the practical work done by the League may be mentioned the prosecution of very many

cases in which the rights of wheelmen were sought to be invaded. The passage of the so-called 'Liberty Bill,' by the New York Legislature, is a case in point. This was framed and pushed through by officers of the L. A. W. This measure, in brief, provides that no laws or local restrictions shall be enacted against the use of the wheel in the State of New York, that are not equally applicable to vehicles drawn by horses. New York wheelmen reaped the advantages accruing to an extent not anticipated. Central Park was immediately opened. The highways of the State were made pleasant to ride on, because farmers and other drivers knew that the Legislature had made wheelmen their equals. Other States have been worked by wheelmen, and bills of a like nature have been passed.

"The moral force of numbers is incalculable. It is a comparatively easy matter to get justice when twenty thousand men ask it. In this age the effort of the individual counts for less and less, and the concerted efforts of many for more and more. Often when the public, or even local boards and councils, take little notice of one rider or of a club of several, they can see the national organization extending into their legal and political neighborhoods without glasses. Even one wheelman with the League ready organized to back him is, if not a majority, at least a minority of sufficient consequence to be respected. The presence even of this body of thousands, combined and officered for the purpose of securing rights, has been found very potent by those who have been in positions practi-

cally to know. Every cycler should add his name and give us numbers that will command respect in the courts and in legislative halls.

"Before the formation of the League the authorities of Boston, Providence, Hartford, and Brooklyn had in turn denied bicyclers the rights of the streets; and they had been brought to recede from positions not tenable in law or justice. But the result in the first only of these cities was brought about by local influences; in the other three cities the freedom of the streets was gained with the aid of more or less concerted general aid of wheelmen.

"The League exercises a healthy supervision of racing on the wheel, and provides a code of rules for the best government of this branch of the sport. Through the influence of the League, amateur cycle racing has been kept above the level of the contests held in kindred sports.

"The crying need of the hour is for better roads. To obtain reform in this direction is one of the objects of the League. Already much work has been done, but there is very much yet to be accomplished. Plans are on foot for the systematic pursuit of this object, and a strong movement is being made all along the line. We need the co-operation of every cycler in this laudable undertaking. In this work the horseman will join hands with us, but cyclers will take the lead. It is proposed, not only to show townships the advantage of good highways, but to compel them to build and maintain the very best. Let every wheelman put his shoulder to the wheel. If the League can have fifty thousand members it can do better work.

"League workers in several States, notably Massachusetts, New York, and Rhode Island, have secured the passage of laws requiring townships to erect guide-boards at cross-roads and forks.

"The League invites every amateur cycler in America to join its ranks; but he is doubly welcome who contributes his work and his influence, as well as his dollar, to the cause. There are advantages to be had in membership; but he who says, 'What can I do for the cause?' is a more valuable man to cycling than he who says, 'What am I going to get for my dollar?'

Learning to Ride.—*See Chapter on* LEARNING.

Legal Rights of Cyclists.—(*See also* RIGHTS OF CYCLISTS ON THE ROAD.) A cycle is a carriage and has the same rights and privileges to the use of the road that other species of carriages have. It has no right whatever to the use of sidewalks or side paths, and if a rider is ever forced upon them by an unrideable piece of road, he should exercise the utmost caution not to offend pedestrians, and should courteously request space when necessary to pass anyone. If forced to use a path, one should never noisily warn off pedestrians by use of bell or whistle, but should ride slowly, and politely ask for right of way. On the road the cyclist should remember that he has a light, easy-going steed, and should not attempt to force every vehicle, especially heavy ones, out of their tracks, if he can safely find room to pass them. When he has not room, a polite request

will secure the needed space far more easily than a whistle blast. Whistles are often valuable for warning; but, when practicable, it is better to use the voice. It is highly desirable, too, that wheelmen should observe the usual rules of the road, and not neglect them, as so many are tempted to do, because they require so little room that it is quite as easy to pass on the wrong side as on the right one.

Lending Machines.—Never do it.

Light Machines.—*See* WEIGHT OF CYCLES.

Lubricants.—*See* CHAINS ON CYCLES, *and* OIL.

Luggage Carriers.—Light skeleton frames, fitted to attach to cycles to carry baggage, can be procured from cycle dealers. They may be attached to the handle-bar, steering-post, or frame. Light leather or aluminum cases can also be obtained to fit in the frame, and will carry sufficient articles for a short tour.

Maps.—*See* ROAD BOOKS.

Mounting.—The ordinary methods are by the step, pedal, and curb, and are described and illustrated in the chapters on Learning and Riding.

National Cyclists' Union.—An English organization resembling the League of American Wheelmen, organized to promote cycling interests generally.

The N. C. U. also gives legal assistance to cy-

clists when necessary, and puts up danger boards on unsafe hills. The annual dues are five shillings.

Oil, Oil-can, Oiling.—Good oil for lubricating purposes should be entirely mineral, if the best results are to be obtained. For illuminating purposes, it is necessary to obtain an oil which does not smoke, crust the wick, or jar out, if night riding is to be pleasant.

For oiling purposes, a small, well-filled oiler should be carried in the tool bag, and a larger, common oil-can should be kept standing in the wheel house for convenience of use. It is not necessary to oil very freely. If any runs out it should be carefully wiped off. It is commonly said that one oiling every hundred miles is sufficient. Distance alone, however, is not a perfectly safe guide, as a machine may stand idle for long periods between rides and the oil work out. A few drops tolerably frequently is perhaps the safest method.

Pacing.—A rider paces another when he rides immediately in front of him, picks out the best course, breaks the wind resistance, and maintains a steady pace for the other to follow. The one behind is relieved of considerable nervous strain, meets less wind resistance, and is able to ride faster, and keep the gait up longer, when he is paced. Tandems, triplets, and quadruplets are the best pace-makers, because they can make and keep a good pace, and also break the wind better than single machines. The advantage of pacing is so

great that much better time can be made by a rider when paced than when alone.

Pedaling.—*See Chapter on* CORRECT PEDALING.

Pedals.—All cycles are fitted with ball pedals. The pedal pin is in the center of the pedal, and one end of it is firmly attached to the crank. Just outside of where it attaches to the crank is a groove for one row of balls, and near the extreme outer end is the other groove. Sometimes, for the sake of lightness and appearance, the pin is uncovered between the bearings, and sometimes a very light metal tube incases it. The latter form is to be preferred, as the pedal bearings keep clean for a longer time when it is used, and it only adds a trifle in weight. In another form of pedal, the pin only runs about halfway through, and carries a single bearing near its end, the object being to reduce friction and save in weight,

On the pedals, the feet press either upon two bars of rubber, or on two of thin metal with serrated edges, or teeth. Square rubbers are often used, and are perfectly satisfactory for the purpose. The other sort are called "rat-trap" pedals, and are a trifle lighter. They are fitted now to nearly all machines except those for ladies.

Pedal Slippers.—These contrivances were designed to prevent the foot from slipping when rubber pedals were used. They were curved pieces of metal made to fit around and partially over each rubber, and present on the upper side two rows of

teeth similar to those of rat-trap pedals. Formerly, round, fluted rubbers were used on pedals, and there was then far more chance of slipping than with square rubbers. Such aids are, however, by no means a necessity, if a rider has a proper reach and cultivates good ankle action.

Position.—Undoubtedly that is the best position on a cycle which is the most comfortable and safe, and which gives the best control and greatest ease of propulsion. The question, if the reach is right, is how far fore or aft the saddle is to be placed in order to meet all these requirements to the greatest extent. Some hold a theory that a perfectly vertical action is the only proper one, as they say that it enables the rider to utilize all his weight, and so lightens his muscular work. They sometimes carry this theory so far as to place the saddle almost in front of the pedals, which arrangement makes the pedaling even slightly backward in direction. In this position, the rider's weight is principally relied on. The erect position one has in walking is changed into a constant forward inclination of the whole body which, physiologically, is bound to be wearing; the natural movement of walking, which moves the feet forward in advance of the body to receive its weight, is superseded by an unnatural position and motion; fine ankle action is out of the question; good muscular work is done at a great disadvantage, and there follows a loss of power which only very powerful riders can bear. The steering is also rendered more sensitive by this position.

The notion that weight can do the bulk of the work on a cycle is erroneous. A skillful rider, in proper position, be he never so light, can easily outride a much heavier and more powerful man who is far forward, and who depends on his weight. Of course it is desirable to secure a position in which a rider's weight can be used to advantage; but to do so at the expense of ability to utilize muscular energy to the greatest advantage is a serious blunder. Experience shows every day that it is not weight and strength which tell. Skill is far and away the first requirement for success in any sort of riding, and outside of men in training, light and middle weight riders are pretty sure to be able to "do up" their heavier companions.

On the other hand, it is almost as bad to be too far behind one's work, and so approach the ineffective position of the old velocipede or "bone-shaker." Up to a certain point, the nearer the rider's weight is carried to his driving-wheel axle the easier will the machine steer; but, placing the saddle too far back will take too much weight off the steerer, make the handles difficult to reach and the pedaling awkward. Placing the saddle too far forward makes the steering less steady and the action too vertical. For road riding purposes, a position a few inches back of the crank axle is undoubtedly the best. The action is then near enough to the vertical to allow of the best use of all the rider's weight, and far enough from it to admit of good ankle action and the best application of muscular power. The advice of one of the

greatest of road riders, M. A. Holbein, given in 1889, is as good now as it was then. He says:

"In the first place, it is astonishing that out of the very large number of cyclists, but a very small percentage have their saddles in the right position (viz., far enough back), which will enable them to use their power to the greatest advantage. It is a very prevalent, though erroneous, idea that the vertical position is the correct one; at first sight the theory certainly seems feasible, but that it is incorrect is easily proved by a few trials. With the vertical position a rider drives his machine by his weight, and more or less stamps on his pedals; it may be possible to get a good pace, but at an immense cost of power, and cannot be sustained for any considerable length of time. It is also impossible to acquire a good ankle action with this position.

"The position of the saddle should vary according to the nature of the road to be ridden upon. For a moderately hilly district, the peak of the saddle should be about three inches behind the center of the crank axle, while for flat roads (such as the Great North Road), six inches is allowed to be the best position. Always sit well back and push from the broadest part of the saddle.

"Many riders who persistently stick to the vertical position say they have tried their machines with the saddle six inches behind, but cannot get on at all. The reason of this is, that they jump at once from one extreme to the other; if, instead of doing so, the rider will come back gradually—say two inches at a time—he will thus become accustomed

to the different position by degrees, and I am quite sure that with each stage of going farther back the rider will experience a corresponding increase of pace."

Quad or Quadruplet.—This is a bicycle with a frame long enough to carry four riders. It is immensely fast, and used almost exclusively for pacing wheelmen in their attempts to ride extremely fast and break records.

Racing.—Preparation for racing is treated of at length in the chapter on Training, and hints about racing are also given there. Outside of that, a question that has been agitated a good deal will be touched on here. It is whether, in a contest, the competitors ought to seek to make fast time as well as to win; or, whether they should endeavor to win without regard to the time made. The first method is called "riding all the way"—that is, at great speed; the second is called a "waiting" race.

The plan of "riding all the way" has been advocated on account of many races, in which the competitors were much afraid of each other, having degenerated into mere crawls, and the final spurt been relied on for success. This has come about naturally, because it is well understood in all racing that it is a great advantage to be in a position to watch one's competitors, and also that it is much easier to ride when someone is just a trifle before you, or "making the pace," as it is called. Moreover, it is unnatural to expect a man to tire himself

unnecessarily in order to make slightly faster time, if he can win just as easily while expending less energy. Records are best attained under other conditions, and many a race has been won from stronger riders by means of superior head work, or generalship.

It follows from these considerations that a man with good judgment will seek to keep in a position in which he can watch his competitors, until the time for his final effort comes. If particularly fast time is sought, extra prizes, or other inducements, must be offered for it. Even then, however, it is not always secured, as many men prefer to make sure of winning than to set the pace with a view to fast time, and then be beaten on the final spurt by someone who has followed and watched for his opportunity.

Railway Charges.—Most railroads formerly made exorbitant charges for the transportation of cycles. This annoyance has been largely remedied, and in many cases entirely removed, through the action of the League of American Wheelmen, whose Transportation Committee have the matter in charge. Many roads now make no charge when the cycle accompanies its owner; while others have merely nominal rates.

Record of Riding.—*See* BOOKS FOR RECORDS.

Renting Cycles.—In many localities it is possible to hire machines at a fair rental for almost any period from an hour to a season; but, if one rides much, it is as cheap, as well as pleasanter, to

own a mount. Rented machines often get such hard usage that some dealers have discontinued renting. Though not sending machines upon the road, they, in many cases, still provide both wheels and places for teaching purposes.

Repairing.—A cycle has so many delicately adjusted parts that it requires a little constant attention (a trained glance generally suffices) to see that it is kept in order. If properly watched, cleaned, oiled, and adjusted, the chances are that, if it is a really good wheel, nothing short of outright accident will make a visit to the repair shop necessary. But if the wheel gets little, or no, proper care, it will need occasional overhauling—perhaps once a season. It is a good plan not to do anything to a wheel that is not clearly necessary, as bearings once taken apart are rarely adjusted properly by a novice, and a machine that is much fussed over will sooner need overhauling by a repairer than will one that is not taken to pieces.

Ride, Length of.—A good many hints on this point are given in the chapters on Learning and Riding. Even those, however, who have little to learn on those subjects cannot realize too fully that short, brisk, regular rides are the most beneficial, and soon fit a man for long, hard ones, while riding that is occasional only does little to develop strength. When one rides infrequently, he cannot be too cautious about the amount he does at one time.

Riding Suits.—*See Chapter on* CYCLING COSTUME.

Rights of Cyclists on the Road.—The right of the cycle on the road is the same as that of other vehicles,—neither more nor less,—and is so held by the courts. Wheelmen have, in some places, been put to considerable labor and expense to establish this fact; but have done so with uniform success, chiefly through the efforts of the League. Of course, when the cycle makes its first appearance in new regions, the blind conservatism which seems to be inherent in human nature is apt to breed prejudice against it; but moderation and experience, with firm prosecution of any case of infringement of rights, will soon put things on a right basis.

In many localities wheelmen have been accorded advantages much in excess of their *rights*. They have been granted the privilege of using side paths and even paved walks; no objection has been made to their coasting on crowded hills, and forcing other vehicles from their track; and they have been permitted to ride at racing speed, even on crowded highways. Such concessions have had the effect of making many wheelmen very careless of the rights of pedestrians, and of those of drivers of wagons and carriages, while asserting their own rights *and privileges* to the full. By so doing they have intensified the prejudice already existing in some quarters against the sport, and have aroused the prejudice of others whose rights have been infringed by being rudely driven from their path, or portion of the road, by the necessity of giving ample space to some reckless rider. It is not only bad form and worse manners to act in this way, but it is most wretched policy, for it

injures the whole body of wheelmen in the eyes of the public.

Where roads are bad and wheelmen are permitted to use side paths, they ought to reciprocate the privilege accorded them by extending every possible courtesy to pedestrians, never warning them off the path by bell or whistle, but rather, by riding slowly and requesting the pedestrians to kindly allow their passage, and thanking them when they have done so. There are many cyclists who are thoughtless in these matters, and there are others who pretend to believe that it is pusillanimous to extend such courtesies; but they ought to remember that they are on a path *only by courtesy*, and are bound, in common decency, to return that courtesy.

The following concise statement of the "Law of the Road" is from the pen of Frank C. Park, Esq., by permission of the *Bicycling World*, in which paper it first appeared:

"The Law of the Road is a rule of action governing every person passing along public highways. Whether walking, driving, or riding in a vehicle along any public thoroughfare, carriage-way, horse-way, or foot-way, he is in law bound to obey the law of the road, and he violates it at his peril.

"1. Turn to the right. When parties driving vehicles meet on a highway, it is the duty of each to seasonably bear or keep to the right. [3 Mass. 360; 28 Mich. 32; 14 N. H. 307.]

"The law imposes this duty; but his disregard of that duty will not justify the traveler who may be on the proper side of the road in voluntarily and

carelessly permitting himself to be injured in person or property, and then seeking to recover damages therefor from his fellow traveler who was wrongfully on the left of the center of the road. [12 Met. 415; 25 Me. 39.]

"Proof that one party was driving on the left of the road does not therefore make him liable for the damages that occur—the other party must use ordinary care to avoid injury. [3 Mass. 360; 7 Wis. 527; 12 Mo. App. 354.]

"The statutes of the different States vary as to whether travelers shall turn to the right of the *center* of the road or the *traveled part* thereof. The New York statutes declare that vehicles meeting in a public highway shall seasonably turn 'to the right of the center of the road.' And the 'center of the road' is construed by the courts to mean 'the center of the worked part of the road.' [7 Wend. 186.]

"The statutes of Maine, Michigan, Illinois, Ohio, Rhode Island, and Wisconsin require vehicles meeting on public highways to turn to the 'right of the middle of the traveled part.' The statutes of all the other States, except a few of the Eastern, correspond with that of Wisconsin. That of New Jersey simply declares 'keep to the right.'

"In winter, when the depth of the snow renders it impossible to ascertain where the center or worked part of the road is, vehicles are only required to turn to the right of the center of the beaten or traveled track, without reference to the worked part of the way. [8 Allen 213: 16 Barb. 613; 8 Met. 213.]

"When it is impracticable to turn to the right in meeting another on a public way, one traveler should stop a reasonable time to allow the other to pass; but ordinary care does not require a traveler to so stop. [14 N. H. 307; 23 Wis. 287.]

"When a traveler cannot *safely* turn to the right on meeting another vehicle, the law will not hold him guilty of negligence for not undertaking impossibilities. [5 B. Mon. 25.]

"When vehicles meet at the junction of two streets, the rule *turn to the right* does not apply; but each person must use reasonable care to avoid collisions. [12 Allen 84.]

"Common vehicles meeting street or railway cars may turn either to the right or left. More care, however, is required on the part of the common vehicle driver, if he is driving on the rails of a street railway, to avoid collision, than is required in meeting other vehicles. [15 N. Y. 380, 3 Bosw. 314.]

"2. May use any part of the road. A party having before him the entire roadway free from carriages or other obstructions, and having no notice of any carriages behind him, in season to stop, or to change his course or position, is at liberty to travel upon such parts of the way as suits his convenience or pleasure, and no blame can be imputed to him. [40 Me. 66.]

"3. May cross road. A person may cross a road or pass on the left side of it, for the purpose of turning up to a house, store, or other object, on that side of the road; but he must not obstruct or interrupt another lawfully passing on that side; if

he does he acts at his peril, and must answer for the consequence of his violation of duty. In such a case he must pass before or wait until the person on that side of the way has passed on. [11 Me. 8; 1 Pick. 345.]

"4. Traveling in same direction. When two persons are traveling in the same direction, the foremost one is not bound to turn out for the other, if there is room for the latter to pass on either side. [1 Watts 360.] If there is not room to pass on either side, the foremost traveler should yield an equal share of the way, on request made, if this is practicable. But if it is not practicable, then they must defer passing until they reach a more favorable ground. If the leading traveler then refuses to comply with the request to permit the other to pass him, he will be answerable for such refusal. [25 La. Ann. 236; 40 Me. 64.]

"5. Travelers on horseback. A traveler on horseback meeting another horseman or vehicle is not required to turn out in any particular direction to avoid collision. He must only exercise prudent care to avoid collision. [24 Wend. 465.]

"A horseman should yield all the traveled way to a wagoner. [2 D. & Chip. 128; 23 Pa. St. 196.]

"As a person on horseback may turn out on any side that suits his convenience, the driver of a vehicle is not therefore bound to watch and take the opposite side, but may disregard the horseman altogether and occupy the whole of the traveled part of the road.

"6. Rate of speed. Driving at immoderate

speed is culpable negligence, and if injury results from it, without fault on the part of the person injured, the author of it will be liable therefor. Driving on a public way at the rate of a mile in four minutes has been held unlawful and negligent. [Kenedy *vs.* Way, Bright 186.]

"The same ruling, however, would not apply in the case of bicycles, as they are capable of being stopped quicker, and while in motion can be controlled better than a horse. But a bicyclist riding through the streets of a thickly populated city could hardly ride faster than a mile in four minutes and be using ordinary care; while over country roads, riding at the rate of a mile in three minutes would be using ordinary care for the rights of others.

"7. Foot passengers. Persons on foot have a right to use the carriage-way as well as the side-walk, and walking in the carriage-way is not *prima facie* evidence of negligence. [42 Me. 332.]

"Foot passengers crossing the street of a city have no prior right of way over a passing vehicle. Both are bound to use ordinary care to avoid collision. [54 N. Y. 245.]

"8. Unusual modes of locomotion. Persons using unusual modes of locomotion, or transporting unusual objects over a highway are not therefore negligent. Those using horses cannot exclude those using bicycles or engines. Improved modes of locomotion are admissible. But drivers of unusual vehicles should assist teamsters, if necessary, in passing it. A right of action in such a case can only grow out of the question whether the

new vehicle has been used negligently or not. [34 Mich. 212; 12 R. I. 166; 21 Ill. 522.]

"9. Private ways. The law of the road applies to private ways as well as to public ways. [8 Allen 242; 23 Pick. 24.]

"10. Impassable roads. Travelers may pass over an adjoining close when the highway is obstructed or impassable. [53 Me. 160; 18 Tex. 858.]

"11. May assume others will be careful. A person lawfully using a highway has a right to assume that a fellow-traveler will exercise ordinary care and prudence; and this warrants him in pursuing his way in a convenient manner. [28 Mich. 32; 97 Pa. St. 70.]

"12. Injury from defective way. If by reason of the defective construction or want of repair of any highway, a person or his property becomes injured, while with ordinary care he was traveling thereon, he can recover damages for his bodily and mental suffering and for injury to his property. [48 Wis. 334; 49 Wis. 125.]"

Road, Rules of the.—The legal side of this subject will be found under the head of "Rights of Cyclists," immediately preceding. There are, however, some details which experience has molded into custom that ought not to be disregarded.

It is extremely easy for wheelmen to forget the common rules of the road on meeting and passing vehicles, on account of the little space cycles require in order to pass other vehicles. But cyclists are not absolved from adhering to custom on this

account. Moreover, the fact that cycles pass so silently and quickly is an additional reason for being punctilious in observing all road rules, and so passing vehicles on the side where drivers expect to see them. Everyone knows that when two vehicles meet, each one should turn to the right. Nearly everyone knows that when one vehicle overtakes another, the rear one should advance on the *left* side of the road and keep the front vehicle on its right side while passing it. Of course, if the front vehicle should be so far to the left of the road that there was little room for passage on the left side, while there was ample space on the right, the driver of the rear vehicle should exercise his judgment on which side to pass, and would usually go where there was most room.

When two cyclists are riding abreast and either meet or overtake a vehicle, the one *nearest the center of the road* should fall back and allow the one on the outside to lead. This means that the outside rider (the one nearest the side on which passage is to be made) is always to lead on passing vehicles—when a vehicle is met, the right-hand rider becomes the leader while passing it; when a vehicle is overtaken, the left-hand rider becomes the leader while passing. On no account whatever should a party separate and pass on both sides of a vehicle. It is very bad form, foolish, and dangerous, and very liable to startle even quiet horses. Nor, in passing, should a cycle be run any closer to a horse than is necessary. If the party is a large one, the pairs of riders should be careful not to crowd too closely, as sudden reduction of speed,

meeting vehicles, or the presence of ruts, will often cause confusion and accident.

Unfortunately, many cyclists are careless of observing these rules. They ought to be rigidly observed, both in justice to the users of all other vehicles, and because their strict observance tends as greatly to raise public opinion regarding cyclists as a class, as utter disregard of them tends to lower it.

Road Books and Maps.—One of the benefits which wheelmen have conferred upon the community has been the publication of many books and maps giving detailed, but condensed, account of the condition of thousands of miles of roads in different States, the exact distances between towns on these roads, and the best hotel in each town. These works were designed primarily as guides for wheelmen in their longer rides and tours; but are also in demand for the use of driving, equestrian, and pedestrian tourists. By their use a tourist can lay out a tour in nearly any one of the principal States, of any length he desires, and know in advance almost exactly what conditions and conveniences he can secure on the trip.

Touring awheel is steadily increasing in favor, and the demand for these works is becoming correspondingly larger. They are issued by the State divisions of the League, and are usually supplied the members of the issuing division at cost. To others a fair retail price is charged. In some cases, where a division has had a full treasury, the books have been supplied to members without cost,

largely, however, with a view to increasing membership. Good state and county maps, which are occasionally of assistance in planning tours, can also frequently be obtained. Information as to special routes between particular points can nearly always be obtained from some League member by means of a note of inquiry to the official organ.

Rub-down.—*See* BATH.

Saddles.—The beginner almost always complains of his saddle. Sometimes it is because it is not adjusted properly, but more frequently it is because he does not sit right. He uses it as he would a chair, upon which he places his whole weight, and then complains because the vibration of the machine jolts or moves him around and makes him sore. The principal difficulty lies in the fact that he does not depend enough on his pedals; he should carry his weight very largely on them, and not hang upon the saddle. If he does this, and gets the right adjustment, saddle soreness and all discomfort will be removed, and he can suit his fancy as to style and size.

Shoes.—Low shoes with moderately thick soles are to be preferred for riding, as they allow the ankle freedom of motion. It is well, but not necessary, to have rubber soles on them if rubber pedals are used. If rat traps are used, it is best to have indentations made to correspond with the points of the pedal plates. If possible, it is most satisfactory to keep a pair of low shoes, shod as above, for bicyle riding only, and to always use them.

Sociables.—These were tricycles built sufficiently wide to obtain room to carry saddles and gearing for two riders side by side between the driving-wheels. They were very cumbersome machines, awkward to handle, and about as wide as a wagon. They were also heavy and slow. But in spite of these disadvantages they demonstrated the pleasantness of double machines, and made it easier and pleasanter for women to learn to ride. They were soon entirely superseded by the tandem tricycle, and later by the tandem bicycle.

Spanners.—*See* WRENCHES.

Spokes.—The most common form of spoke was formerly the "direct." It is a length of wire, headed at one end, and with a worm, or screw, at the other. The headed end holds firmly in a hole countersunk in the rim. The other end is generally somewhat enlarged, or "butt-ended," so that cutting the thread on it may not weaken it, and screws into the hub flange. Should one become loose, it can easily be tightened by the use of a spoke wrench. Used generally with solid rims, there is a certain amount of elasticity to a wheel so built. But direct spokes do not transmit the power absolutely direct to the rim, a wheel built with them not responding quite so quickly as a tangent spoke wheel.

The "laced" spokes sometimes used were formed with each length of wire making two spokes. A length of wire is headed at the rim, carried down through a hole in the thin steel

flange of the hub, and then back to the rim, at a slight angle, and there held by a small nipple. They are set at a partial tangent to the hub, and alternate at the rim, thus giving a more direct pull than do the "direct" spokes.

The spokes sometimes called "double tangent" are similar to the "laced"; but are tied and soldered together where they cross one another, thus making a very stiff wheel.

The "single tangent" spoke is sometimes called a cross between the direct and the laced. It is held with a nipple at the rim; but is headed through a thin steel flange at the hub, and, being set at an angle, has a partially direct pull. It is very neat, and makes a strong, rigid wheel.

The "true tangent" spoke is a single spoke, fastened like the single tangent, but set at a true tangent to the peripheries of the hub flanges both forward and backward. They are set on both sides of the flanges, those on opposite sides departing in opposite directions. They cross each other five or six times in passing to the rim, and are securely tied and soldered at the points of intersection. Not only is a wheel so built perfectly rigid, but the "true" tangency of the spoke transmits to the rims practically all the power applied. The wheel responds instantly to pressure and is the best possible sprinter and hill climber.

The spokes now almost universally used are of the single tangent order, and are double butt-ended, or slightly larger at each end than in their center. Each one crosses two others, and is tied and soldered at the second crossing.

Tandems.—Tandem *tricycles* were built to carry one rider before the other. In this way the normal width of the tricycle is preserved; the frame is made a trifle longer and stronger; and a second saddle, with chain and pedals, is added. A double machine is thus secured, as easy to handle as a single, and only a trifle heavier. Experienced riders, accustomed to pedaling together, can propel one at very good speed. Most tandem tricycles are made convertible—that is, one saddle, with its accompanying chain and pedals, can be readily removed so that the machine is adapted to the use of one person. On a tandem tricycle, one seat nearly always is, and both may be, adapted to the use of a lady.

The tandem safety *bicycle* is an elongated safety bicycle with saddle and gearing for a second rider, both riders being seated between the wheels. It is a very easy running machine, with the greatest possibilities for enjoyment. The front seat is often arranged for a lady's use. The steering is usually controlled from the rear seat by a connecting rod below the riders. A fairly good safety rider can take anyone on the front seat almost as readily as on a tandem tricycle. Two good riders can get great speed out of it.

Tandem Attachment.—This arrangement consists of tubing carrying saddle, chain, and pedals for a second rider, with easy means of attachment to the rear of a tricycle, the object being to form a tandem at any time out of a single tricycle, and with only the additional expense of the attachment.

A tandem formed in this way, however, is not as satisfactory as a machine originally designed and built for two riders. As a rule, convertible machines are less satisfactory in their converted form than machines built for but a single purpose.

Testimonials.—A veteran in cycling has said that a man cannot understand the character of a wheel until he has ridden it five hundred miles, nor be in a position to give a thoroughly intelligent and comprehensive opinion on it, until it has carried him for a thousand miles, and over all sorts of roads. This is an extreme view to take; but it is perhaps only the natural reaction from the many hastily formed and superficial opinions, and fallacious claims, which are offered as proof of superior merit. Testimony to merit is always desirable and welcome, and consensus of opinion is certainly valuable in establishing a point; but, with cycles, experience is of great importance, and the more a man has ridden his wheel, the more intimately and certainly may he be supposed to know its virtues.

Thirst.—*See* DRINK WHILE RIDING.

Tires.—Up to about 1890 solid rubber tires, varying in diameter from one-half to seven-eighths of an inch, were used on all wheels. Then came cushion tires for a year or so. These were made of rubber, usually an inch and a quarter in diameter, and had a hollow core of about three-eighths of an inch. They were soon followed by the pneumatic, which began at two and a half inches in diameter,

and has been slowly reduced until inch and three-quarters, five-eighths, and one-half are now the prevailing sizes. Pneumatic tires are either double tube or "hosepipe." The former consist of an inner, thin rubber tube, which holds the air, and an outer casing or shoe, which is the wearing part. They may be cemented to the rim, in which case they must be removed when repairs are required; or they may be held in a specially shaped rim by their internal air pressure, in which case only a small portion of the tire needs to be removed for a repair. "Hosepipe" tires have but a single tube, which is both air tube and wearing shoe in one. In principle, a simple, detachable, double-tube tire is undoubtedly best, as a complete and permanent repair can be very quickly made, and simplicity of construction, all things equal, is about the most important feature.

Toe Clips.—These ingenious little devices are made of light metal to attach to the pedals, the upper part curving slightly over the toe, by which means they hold the foot in position, prevent slipping, and, to a certain extent, increase the rider's ability to claw the pedal around as is requisite in good ankle action, and also prevent slipping the pedal when traveling at high speed.

Tool Bags.—Every cycler requires a small tool bag to contain oil-can, wrench, pump, and repair outfit, which should be snugly packed to prevent rattle. These articles are really the only essentials, though some riders carry such things as a screw-

driver, extra nuts, and lock and chain, while others carry nothing. Good bags are furnished with most machines. It is desirable to have one as small as will hold the necessary articles comfortably, without rattle, and to see that it is strapped firmly to the machine.

Touring.—*See Chapter on* RIDING AND TOURING.

Training.—*See Chapter on* TRAINING.

Triplet.—The first triplet was a four-wheeled cycle, with three seats in a row, tandem fashion, the middle rider steering, and the first and third seats suitable for ladies' use. It was a fast, easy-running machine, but never came into general use. Triplet safety bicycles are now built, and are used principally on the track for pacing men in their attempts at very fast time and the establishment of records.

Two-Speed Gears.—For the general principles on which all questions of gearing are based, see chapter on Speed and Gearing. The utility of changeable gears has long been discussed, and riders generally have drifted back to the belief that each one can find a single gear that is suited to him, and the masses are generally right. A very high gear or a very low gear is *never* necessary, while an intermediate fixed gear can be found to meet each person's requirements.

Use and Abuse of Cycles.—If manufacturers of cycles could be assured that their productions

would always receive good care, and be put to their legitimate uses only, they would be more ready to build their standard patterns of very light weight; but knowing, as they do, the amount of misuse, abuse, and unnecessarily hard treatment to which cycles are subjected, they are obliged to prepare for it. But even the best preparation in the way of proper metal, good design, skilled workmanship, and sufficient material, will not prevent mishaps while owners of wheels slam them around; run up or down high curbs; leave them with dirt and grit covering bearings and chains; and with head, bearings, and chain unadjusted. It is hardly too much to say that the durability of a machine depends almost as much upon its being properly ridden, and suitably cared for, as on its intrinsic character.

Cyclists vary in their notions of the legitimate use of a wheel, from the extremely cautious to the most reckless. But even those who are careful enough in the matter of actual road use are sometimes subject to misfortunes, because they fail to give their wheel the little attention which is absolutely essential if they wish to keep it in safe not to say first-class running order. If riders expect satisfactory and permanent good results from it, they must ride it with judgment and give it care.

Vibration.—A wheel revolving upon the road produces a certain amount of vibration, even though shod with rubber tires. Vibration is increased by the use of a small wheel, a very light

wheel, small tires, or by riding at considerable speed. It is reduced by using a large wheel, a heavy wheel, large tires, or by a slow gait. Vibration is called *tremulous* when we mean the continuous throbbing imparted to a machine as it meets the innumerable little inequalities of every road surface. It is *jolting* vibration when we mean the bumps produced by holes in the road, or by passing over obstacles of some size. Tremulous vibration is, therefore, a constant factor, though varying in intensity according to the condition of the road surface. Jolting or bumping vibration is only occasional, and can be, to a considerable extent, avoided.

Vibration is imparted to a machine at its points of contact with the road, viz., its tires; consequently, it is desirable to provide such tires as will absorb vibration to as great a degree as possible. On reaching the machine, vibration is imparted to the rider at his three points of contact—saddle, pedals, and handles; consequently, the problem is *first*, how to stop vibration at the tires, and, *second*, how to take up whatever is transmitted to the wheel, so that none will reach saddle, pedals, or handles.

Tremulous vibration can be very largely absorbed at its point of origin (the road) by means of proper tires, so that what little reaches the rider is not noticeable. The "pneumatic" tire (see TIRES) accomplishes this satisfactorily. Jolts or bumps, however, cannot be entirely absorbed by means of any tire—they can only be overcome through the use of an effective spring frame,

which will yield to a reasonable extent. Therefore the *theoretically ideal* machine, which will provide luxurious riding and completely annihilate vibration, needs a tire that will take up all tremulous vibration, and a frame that will destroy all jolting. It must be remembered that in whatever form a spring frame is made, it is absolutely necessary that handles, saddle, and pedals should always be rigid in regard to each other—that is, no spring can be introduced between any two of them allowing them to vary at all from their relative positions.

Whether the *theoretical ideal* is really a *practical need* is quite another question. As a matter of fact a person would need to be in a very unusual condition, or of a very uncommon temperament, if he could not be made comfortable with the improved pneumatics now in use.

Watches.—It is sometimes said that a good watch is injured by being carried constantly on the wheel; and some riders, believing this, leave theirs at home, or carry a cheap one. The writer has never found any bad effects, however.

Waterproofs.—It is exceedingly debilitating to ride in a rubber coat, as the full action of the skin is thereby seriously impeded, and the clothes become saturated with perspiration. If properly dressed in all wool, a wetting seldom does harm. If a waterproof is carried on a tour, and rain falls, it is more prudent to stop, don it, and wait till the shower has passed.

Weight of Cycles.—A prevalent notion regarding the weight of cycles seems to be that the lighter a machine is, the easier it must run. While for race tracks this is practically true, such conditions as are met with in average road riding alter the case considerably. Lightness is certainly a most desirable and important quality to secure in a cycle; but the moment it is obtained at the expense of rigidity, or at the expense of generous tires, it does not make the machine any better as a whole. Lack of rigidity means waste of power, and small tires mean more vibration; and both these are detrimental to ease of running, especially at any distance. Should lightness be further obtained at the expense of a well-stayed frame, or use of insufficient metal, durability is largely sacrificed. It does not follow from this that a machine need be heavy; for a properly proportioned one of medium weight and first-class quality is just as strong; but it does follow that extraordinarily light machines are not suitable for road work, and are not as durable as those of medium weight.

Since 1892 the advance that has been made in building light bicycles has been absolutely extraordinary, and in less than three years the weight of road machines has been reduced from forty-five to twenty-two or twenty-three pounds. No man, however heavy, need ride a modern wheel of over thirty pounds' weight; very few need ride over twenty-five pound wheels, while the majority of good riders can be safely fitted with wheels that weigh but twenty-two or twenty-three pounds. Of course a good many wheels at even less weight

than this will be used on the road, but it should be done with extreme caution. Track racers run from fifteen to eighteen pounds.

Whistles.—*See* BELLS AND WHISTLES.

Women, Cycling for.—*See* LADY CYCLISTS, *and Chapter on* CYCLING FOR HEALTH.

Wrenches.—Always carry a small monkey wrench of good quality. Do not depend on spanners.

APPENDIX.

THE INFLUENCE OF THE BICYCLE IN HEALTH AND IN DISEASE.*

By Græme M. Hammond, M. D., New York. Professor of Diseases of the Mind and Nervous System in the New York Post-Graduate Medical School and Hospital; Professor of Mental and Nervous Diseases in the University of Vermont.

BOUT two years ago I called attention to the treatment of certain diseases of the nervous system by the proper use of the bicycle.† This was the first attempt, at least in this country, to call the attention of the medical profession to a therapeutic agent undoubtedly of great value. At that time comparatively few physicians had had any practical experience with the bicycle, but since then wheeling has taken hold of the popular fancy to such an extent that thousands now ride where formerly hundreds rode, and the medical man, who at one time considered bicycle riding degrading to his professional dignity, now joins with his lay brothers in the pursuit of health and pleasure on the wheel. The

* Read before the New York Academy of Medicine, December 19, 1894, and now reprinted by permission from the *Medical Record*.

† *Journal of Nervous and Mental Diseases*, January, 1892.

universal popularity of the wheel—and it seems to be growing in favor every year—has undoubtedly not only been a source of great pleasure to thousands, but must also have had an appreciable effect upon the health, either beneficially or the reverse, and physicians are now arriving at a more intelligent conception of the possibilities of the wheel, both for good and for evil. The medical journals of this and foreign countries are daily adding to the literature of the subject by the reports of diseases which seem to have been induced or are aggravated by the use of the wheel.

The question concerning the deleterious effect on the human organism by the injudicious use of the wheel concerns the numerous specialists in medicine as well as the general practitioner. There is hardly an organ in the body which may not be influenced one way or the other by the proper or improper use of the bicycle; and hence it is that all medical men should study this question carefully and endeavor to arrive at the exact facts of the case. To this purpose I propose to consider the subject from the following standpoints: 1. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased.

Little need be said about the rational use of the bicycle by healthy persons. It is only when the wheel is improperly or immoderately used that it constitutes a source of danger. The question will at once arise as to what constitutes this moderate and rational use. As men differ, among other things, in points of age, temperament, physical strength, and power of endurance, so is it absolutely impossible to prescribe any general rule which will

be applicable to all men. Each individual must formulate rules for his own guidance, and if he is incapable of doing this either because he has not arrived at years of discretion, or because he recognizes his ignorance and distrusts his judgment, his medical adviser should be consulted, who by studying his physique, heart measurement, and lung capacity, can judge with considerable accuracy the amount of exercise which is most conducive to healthy physical development. But as a general rule, the average individual, after a fair amount of experience, becomes quite competent to determine his own capabilities and requirements.

Let it be granted that an individual uses the wheel properly, what results should he reasonably expect to achieve? Statistics do not supply any information on this subject. No attempt has as yet been made, that I am aware of, to study the physical development of men who have been using the bicycle properly for years. I say for years, because the best effects of any form of exercise which is practiced for the purpose of obtaining physical development are never obtained rapidly, and, particularly in young subjects, should only be studied after several years of continuous culture. There being no available literature on the subject, I am obliged to depend solely upon my own observations. This source of information must necessarily be very meager. Although there are thousands who ride, there are comparatively few within my reach who have been riding long enough to render statistics on their physical development of much value. I have, however, collected fourteen cases of amateur riders who have kept accurate records of the years they have been riding, and ap-

proximate records of the number of miles they have ridden in this time. These cases I have examined and endeavored to tabulate the most important features ascertained. These men have ridden from five to thirteen years, and in that time have travelled from five thousand miles to twenty-seven thousand miles.

TABLE No. 1.

Amateur Riders.

Case.	Age.	Ridden a Wheel. Years.	Miles Ridden.	Chest Expansion. Inches.	Heart.	Muscular System.
1	37	5	22,000	1¾	Slight hypertrophy.	Well developed.
2	25	10	27,000	1¼	" "	Legs well developed, arms and trunk fair.
3	36	5	8,000	2	" "	General development greatly beyond normal.
4	42	12	24,000	1½	" "	Well developed.
5	46	13	25,000	1	Normal.	Average.
6	24	13	14,000	1⅞	Slight hypertrophy.	Well developed.
7	25	10	20,000	1¾	" "	" "
8	34	7	18,000	1¾	" "	" "
9	30	8	9,000	1¾	Normal.	" "
10	29	7	8,000	1⅜	Slight hypertrophy.	" "
11	26	7	17,000	2	" "	Generally very muscular.
12	24	6	7,000	1¼	Normal.	Average.
13	39	5	6,000	1¾	"	"
14	24	5	5,000	1½	Slight hypertrophy.	Well developed.

Average chest expansion, 1⅞ inch. Heart usually hypertrophied without dilatation. Average age, 31⅞ years. Chest expansion, 13 riders above normal; 1 normal.

This table demonstrates two important facts very clearly: First, that men who have ridden a

great deal for a number of years have acquired simple cardiac hypertrophy without dilatation; and second, that their breathing capacity is greatly in excess of that of the average man. The cardiac hypertrophy that I refer to is due to a simple increase of muscular tissue, and is in the nature of a healthy growth or development induced by exercise. It is precisely similar to the hypertrophy which occurs in any other muscle which has been used a great deal. Hypertrophy in this sense is purely a relative term. For more than a century man has shown a tendency to develop the different qualities of the mind, and has paid but little attention to the gradual degeneration of the muscular system and to the consequential reduction of his powers of physical endurance. This has been one of the natural consequences of the rapid advance of civilization, especially in this country; and this, together with the great development of industries, commerce, and the professions, which have demanded the best energies of our men, finally made us a race of intelligent, clear-sighted, energetic, and nervous people, but very far short of the physical perfection seen in men in earlier ages. The dangers attending this physical degeneration of the race have of late years been gradually instilled into the public mind, and this has resulted in a healthful reaction. Men, and, what is of almost equal importance, women, are gradually beginning to comprehend the advantages of physical development, and are in a fair way to understand that the highest type of man, taken as a whole, is not represented by intellectuality alone, but more properly by a judicious combination of mental and physical vigor. Ten or fifteen years ago it was exceptional to find business

and professional men and women who practiced any special form of exercise. To-day thousands are making physical exercise an important feature of their daily duties; and what is of greater importance, we are educating our children to believe in physical culture and to practice it. The evolution of the bicycle to the form it presents to-day is probably the greatest factor which has influenced the spread of the doctrine of physical culture in this century. As a natural consequence of this gradual but universal physical development, which will only be attained in time, we must expect to observe a relative development of some of the internal organs, particularly the heart and lungs. The simple hypertrophy of the heart observed in most bicycle riders who have ridden to any extent will gradually become more common, and finally will be accepted as normal, and what is known to-day as the normal heart will then be considered degenerated.

A second glance at the table shows that all the riders have a greater breathing capacity than the average man. The chest of the average man expands an inch when the lungs are inflated to their greatest capacity. This has been carefully verified by myself and by others, who have measured many men whose lung-powers have not been developed by special forms of exercise. It is usually believed that the average chest-expansion is three inches, and there are many who can increase the girth of the chest much more than this. It is claimed, for instance, that Sandow's expansion is thirteen inches. This, however, is fallacious and does not by any means express the truth. It is accomplished by a forced expiration before the inspiration, and is

then further augmented by "setting" the scapular and pectoral muscles. In the table I have prepared, the average lung inflation is represented by a chest expansion of one and four-sevenths of an inch, which is an excess of four-sevenths of an inch above that of the average man.

This excess is unquestionably of great advantage to the individual possessing it, when it is taken into consideration what a great influence is exerted on the general health and on the proper performance of the functions of the various organs by a perfect oxygenization of the blood; and when there is added to this the action of a powerful muscular heart, it can readily be perceived that bicycle riding, conducted properly and for a long time, induces a condition of cardiac and pulmonary development which must exert an enormous influence in maintaining the proper functions of other organs; in preparing the organism to resist disease; and in overcoming disease that has been contracted.

The muscular system of the bicycle rider is, as a rule, uniformly well developed. It is often claimed by those who are not properly informed, that the exercise develops the muscles of the legs at the expense of the rest of the body. This is not so. On the contrary, the muscles of the back, chest, arms, and abdomen are employed a great deal—not to the same extent as the muscles of the legs, but sufficiently so to consider bicycle riding an exercise inducing general development of the muscular system.

The observations recorded in Table No. 1 were made on men who have always ridden in the erect posture. A great deal has been said in regard to

the pernicious effects of riding with the body almost, if not quite, at a right angle with the legs. A peculiar malformation of the spine has been reported to result from this posture, and it certainly seems as if the lungs, and consequently the heart, must be greatly hampered in performing their work. To obtain some information on this subject I have carefully examined fourteen professional riders, seven of whom are the most celebrated racing men in the world—men who have obtained national reputations as great riders; who have ridden more races than any other men; and who have ridden faster than any other men; and who always ride with the body at right angles to the legs. These observations I have tabulated in Table No. 2. In no case was there any deformity of the spinal column, and I may say here, if any such condition has ever been observed the number of cases of it must be very few indeed. I have never seen a case of it. They were all well-built, muscular men, but different from those in Table No. 1, who were all amateurs, in that in all cases there was an excessive development, compared to the rest of the body, of the muscles of the thighs, particularly of the *vastus internus* and of the muscles of the abdomen. The development of the abdominal muscles resulted from their continual contraction while maintaining the riders in their racing position. All had cardiac hypertrophy without dilatation. At first glance it would seem as if the lung capacity of the professionals was fully as good as that of the amateurs, and this is true if the measurements of the national champions only are considered.

TABLE No. 2.

Professional Riders.

Names.	Age.	Remarks.	Chest Expansion. Inches.	Heart.	Muscular System.
Zimmermann...	24	American world's champion.	1¼	Hypertrophied.	Well developed. Extraordinary development of abdominal and thigh muscles.
Wheeler..	25	American. Celebrated rider.	1⅞	Hypertrophied.	Well developed. Extraordinary development of abdominal and thigh muscles.
Edwards .	23	England's champion.	1⅞	Hypertrophied.	Well developed. Extraordinary development of abdominal and thigh muscles.
Verheyn..	20	Germany's champion.	1½	Slight hypertrophy.	Well developed. Extraordinary development of abdominal and thigh muscles.
Colombo..	23	Italy's champion.	2	Slight hypertrophy	Very muscular. No special development.
Lesna.....	31	France's 24-hour champion.	2	Slight hypertrophy.	Very muscular. No special development.
Martin....	25	America's 6-days champion.	2	Hypertrophied.	Very muscular, especially in the thighs.
Albert....	28	America's 6-days rider and short distance racer.	1½	Hypertrophied.	Too slender for his height. Muscles not at all prominent except in abdomen.
Berlo	28	American. Short distance racer.	⅞	Hypertrophied, but not strong.	Muscular thighs and abdomen. Chest somewhat sunken.
Knowles..	40	American. 6,240 miles in 60 days racer.	¾	Hypertrophied.	Very muscular.

Names.	Age.	Remarks.	Chest Expansion. Inches.	Heart.	Muscular System.
Foster....	40	German. Long distance rider.	$\frac{3}{4}$	Hypertrophied.	Normal development.
Gross.....	28	American. Short distance racer.	1	Hypertrophied.	Well developed.
Murphy, W. F...	25	American. Class B racer.	$\frac{7}{8}$	Hypertrophied, but not strong.	Not at all muscular except in thighs and abdomen.
Macdonald.....	18	American. Class B racer.	$1\frac{3}{4}$	Normal and very strong.	Small but well developed.

Average age, 27 years. Average chest expansion, $1\frac{3}{7}$ inch. Chest expansion, 9 above normal (these are celebrated riders); 1 normal (1 inch); 4 below normal.

Table No. 2 gives the measurements of fourteen celebrated professional riders. Table No. 1 gives the same measurements in an equal number of amateurs. Comparing the measurements of amateur riders with those of the professionals, who are national champions, very little difference can be observed. These men who ride at racing speed, doubled up like a jack-knife, were as well developed, had just as powerful and healthy hearts, and their lungs could consume as much oxygen as those who sat upright and rode at moderate speed. But it must not be concluded from this that I mean to infer that *any* man can race and ride in the posture of a racer with impunity. Far from it. These men became professionals because they found that nature had particularly adapted them for fast riding. They make a business of it, and are always in the best possible physical condition.

If we turn, however, to the measurements of the

other six professionals, whose inferior capabilities have not allowed them to become national celebrities, we find a very different state of affairs. One has the normal chest expansion of one inch, four below normal, and one is above normal. The latter, however, has been racing but a short time, having recently graduated from the amateur ranks. Comparing the fourteen amateur riders with the fourteen professionals, it will be seen that the average chest expansion of the amateurs is $1\frac{4}{7}$ of an inch, while that of the professionals is $1\frac{3}{7}$ of an inch. The expansion of thirteen amateurs is above normal, and in one it is normal. With the professionals the expansion is above normal in nine, normal in one, and below normal in four. It is quite probable, if professional riders of less phenomenal abilities were substituted in the second table in place of the national champions, the average chest expansion would be found to be below normal.

Excessive work on the wheel is, for the average man, unquestionably injurious, and it seems a fair inference to draw, from a study of these cases, that while many men will, in the course of time, ascertain that nature has adapted them so they may race with impunity, for a time at least; others who are led to emulate their example will certainly injure their health and undermine their constitution. This is particularly true of young lads, many of whom consider themselves the coming racing champions of the world. They can be seen in the streets and on the country roads, tearing along at the top of their speed, the body thrown forward, the back humped, and the arms fixed and rigid, the chest necessarily contracted and preventing its

proper expansion, at the very time when free movement of the chest walls is most necessary. In such cases healthy development is likely to be arrested, and cardiac dilatation, impoverishment of the blood, and lowered vitality of the system are probable consequences. Parents and physicians should use their authority to prevent this abuse in the rising generation, and a youth who will not ride properly should not be allowed to ride at all. It has been claimed that appendicitis can be sometimes attributed to this faulty position in riding. While it is undoubtedly true that persons who ride the wheel, no matter in what posture they ride, may have appendicitis, there is nothing in literature to prove any direct relation between appendicitis and bicycle riding as a cause and effect.

Riding great distances at rapid speed is an abuse of the wheel which cannot be too severely condemned. Anyone who witnessed the last six days' bicycle race, about a year ago, cannot but recall with disgust the sickening exhibition of exhausted riders having to be lifted from and on to their wheels and carried to and from their quarters, their joints swollen and inflamed, barely able to see, and only kept in a conscious condition by the united efforts of trainers and physicians. This, however, is an extreme case, but it is not at all uncommon for large parties of riders of both sexes to go on what are called "Century runs," that is, to ride a hundred miles often within a limited number of hours. To many riders of experience, who are in good condition and possess excellent powers of endurance, this may not be a difficult feat to perform, but many others in making the attempt suffer from exhaustion which leaves its traces for

several days. There are others again who travel shorter distances, but who ride at such speed that they return home thoroughly tired out. This, if it occurs only occasionally, is perhaps of little moment, but when the repetition is frequent it is undoubtedly injurious.

Moderate exercise, properly performed, invigorates the system, strengthens the muscles, and increases the powers of physical endurance, but excessive and exhaustive exercise does none of these things; on the contrary, it is decidedly injurious to health and should never be encouraged. Under certain conditions diseases of the genito-urinary tract may with great probability either be induced, or else, if they already exist, they may be aggravated. Cases of prostatitis, urethritis, and cystitis have been reported, which seem to show quite conclusively that the friction or jolting of the perineum against the saddle was the exciting or aggravating cause. Such cases are due to the carelessness or ignorance of the rider. An individual in riding the cycle, just as in riding the horse, should sit upon the gluteal muscles and not upon the perineum. All bicycle saddles can be tilted either forward or backward, and every person who rides should so adjust the saddle that the weight of the body is borne by the gluteal muscles and not by the perineum; otherwise it is quite probable that injurious results may follow.

Riding upon the perineum may in many instances cause genital irritation, but this can be effectually prevented by the proper adjustment of the saddle. It can therefore be seen that these diseases or conditions are by no means necessary consequences of bicycle riding. On the contrary,

they can be remedied in all cases by the intelligent comprehension of the wrong and its remedy.

The question is often asked, Shall women suffering from abnormal conditions of the uterus and ovaries ride a wheel? I was much pleased, at a recent meeting of the Gynecological Section of the Academy, to listen to the opinions of our leading gynecologists on the subject. It seemed to be the general opinion that this form of exercise was not injurious, but that in many cases of disease it was highly beneficial, either as a means of relieving local congestion, or else acting indirectly on the pelvic organs by improving the general health of the patient.

There is one other condition which deserves mention, and which I am not aware has called forth any comment up to the present time, and that is the effect of bicycle riding on the air passages and as a cause of mouth breathing. On examination I found all of the men enumerated in Table No. 2, and who were professional riders, breathed through the mouth while riding, and that eight of these were habitual mouth breathers. The majority of the amateur riders I have questioned on this subject admit that they breathe through the mouth while riding, but whether the proportion of mouth breathers is greater among cycle riders than among those who do not ride, I do not know; but it is a matter that deserves investigation.

The use of the wheel by persons diseased, when considered in the light of a therapeutic agent, is a subject of considerable importance. It also leads us to inquire whether there are not physical conditions under which the bicycle should be absolutely prohibited. In certain diseased conditions of the

heart, bicycle riding may prove very beneficial. In simple degenerated conditions of the muscular fibers, in dilated hearts either with or without compensatory hypertrophy, and in slight valvular affections, bicycle riding, when properly practiced, may prove of great service, because it improves the nutrition of the organ and develops the muscular fibers, thereby enabling the heart to perform its work more effectually. But no one suffering from any cardiac affection should ever ride a wheel, unless advised to do so by his physician ; and in such instances the physician should make frequent examinations in order to determine whether benefit is being derived from it or not. Where exercise is advisable in heart affections, I know of no better method of obtaining it than by the proper use of the wheel. By riding slowly and on an approximately flat surface the mildest cardiac exercise can be obtained, and this, as the heart improves in strength, can be increased by degrees, and in direct ratio with the cardiac development. By this means the strength of the heart can be greatly increased, thus causing a natural compensation for many abnormal conditions.

But bicycle riding can cause as well as cure cardiac degenerations. If an individual compels his heart to work beyond its capacity and the abuse becomes in any sense continuous, the danger of cardiac degeneration becomes imminent. This is more particularly liable to occur in subjects whose cardiac muscular fibers are abnormally weakened from disease, dissipation, or from long neglect of such exercises as are requisite for maintaining the heart in a healthy condition. In valvular lesions also immoderate riding will unques-

tionably aggravate existing abnormal conditions, and perhaps superimpose another cardiac disease upon the original one. In short, it may be said that bicycle riding may benefit or injure the heart according to the condition of the heart and the manner in which the individual conducts his exercise, and the general principle may be adduced that, while the moderate use of the wheel is conducive to cardinal development, the excessive use endangers cardiac degeneration. I cannot agree with the decision of the French Academy, that "no one should ride a wheel without consulting a physician"; but this rule certainly should apply to all persons who have cardiac disease and to all others whose general health, vitality, and physical strength are to any degree below the normal. What has just been said in relation to cardiac diseases applies in the main to pulmonary affections. I have already shown, as far as the limited number of cases at my disposal permit, that bicycle riding, when practiced by a healthy person, unquestionably develops the lungs and increases their capacity greatly beyond what is now considered to be normal. The knowledge of this fact may be taken advantage of in the treatment of those pulmonary conditions in which a breaking down of tissue will be the natural and probable consequence in the course of time. Moderate exercise of the lungs by the moderate use of the wheel, practiced systematically and for a long time, will undoubtedly retard and perhaps completely arrest some degenerative changes in the lungs. This will follow not only from the direct effect of pulmonary development, but also from the generally improved physical condition which is always a prominent

feature of bicycle riding when rationally practiced. On the other hand, I can conceive of nothing which will be more injurious to certain abnormal pulmonary conditions than the excessive use of the wheel. Not only will this tend to accelerate degenerative processes, but it may also induce them in persons predisposed, particularly if the general vitality is simultaneously diminished.

The same general rule can be formulated here that seemed to be applicable to the heart, that is: That the moderate and proper use of the wheel results in pulmonary development, while the excessive use may be followed by injurious consequences.

In my former paper I showed, by the report of a number of cases, that in certain diseases of the nervous system bicycle riding was very serviceable. That report referred mainly to cases of functional and organic paralysis, and to neurasthenia and hysteria, and demonstrated that in these conditions great improvement was obtained directly from the use of the wheel. My opinions were so fully expressed at that time that it is needless to refer to the subject again, except to state that my experience in the past two years, since that paper was published, fully corroborates the views I then entertained. I only desire to state in addition that I have carefully studied the effects of bicycle riding on numerous cases of functional dyspepsia and constipation, and have observed great benefit in most instances, but only in those cases in which the riding was followed systematically. There are two other conditions I desire to refer to before I conclude what I have to say, in which bicycle riding seems to exert a beneficial influence. These are gout and diabetes. Possibly both of these diseases

are benefited by the great quantity of oxygen consumed; by the improvement in digestion and assimilation; and by the effect that prolonged muscular action has on eliminating certain substances from the system which are either poisonous *per se*, or else become so by conversion. In two cases of subacute gout I have prescribed the use of the wheel and have every reason to feel satisfied with the results. In only two cases of diabetes have I had the opportunity of making observations in regard to the effect of this exercise on the excretion of sugar. These few cases are not sufficient to allow the presentation of any absolute deductions, but the results obtained were sufficiently encouraging to warrant further investigations in this direction. If we accept the view that the manifestations of gout depend upon an excessive formation of uric acid in the system, it can be readily understood, theoretically at least, how bicycle riding can modify or arrest this process. First, by the improvement in digestion and assimilation; second, by the greater demand upon the nitrogenous compounds required by the repair of the muscles; third, by the increased oxygenation of the blood which increases the elimination of urates; and fourth, by the further elimination of morbid material through the increased activity of the sweat-glands.

This theory may be susceptible to criticism, but whether it is correct or whether we must look further for the reasons, the fact remains that benefit is derived in these cases from the use of the wheel. In the two cases of diabetes, experimental studies showed that in both cases, and with no change of diet, the amount of sugar excreted was

diminished when the bicycle was used regularly. The explanation of this fact seems to be reasonable, and is similar to that just offered in reference to gout. The waste taking place in the muscles is repaired from the nitrogenous elements, which otherwise would be converted into urea and then into sugar. The larger the muscles are that are wasted, the greater quantity of nitrogenous substance will be required to complete repair. The largest muscles in the body are in the lower extremities, and consequently bicycle riding, which calls these muscles into active use better than any other form of exercise, operates to excellent advantage. The heart also need not be exercised unduly, which, in these cases, is often a point of considerable importance. It is impossible, in an article on this subject, to enter deeply into the discussion of each one of the subjects touched upon without making a paper of interminable length. I will therefore conclude what I have to say by the statement that experience has shown me that bicycle riding for a healthy individual is one of the most excellent forms of exercise for maintaining health, retarding disease, and strengthening the constitution, and is also a pleasant recreation for the mind; and that in many forms of disease, when used cautiously and under medical supervision, it will often be found of inestimable advantage.

THE END.

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